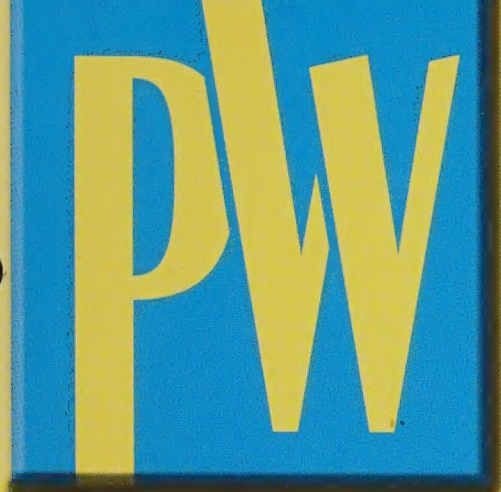




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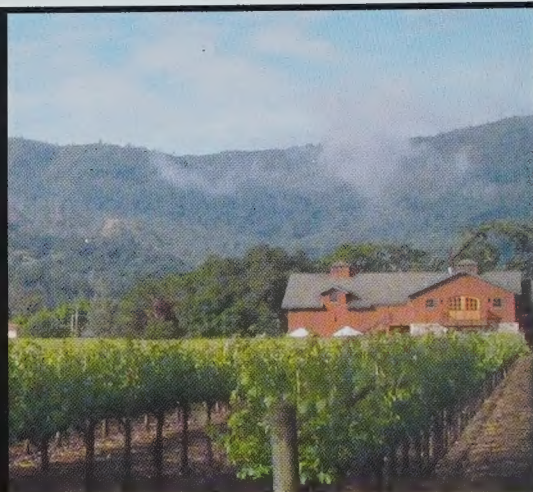
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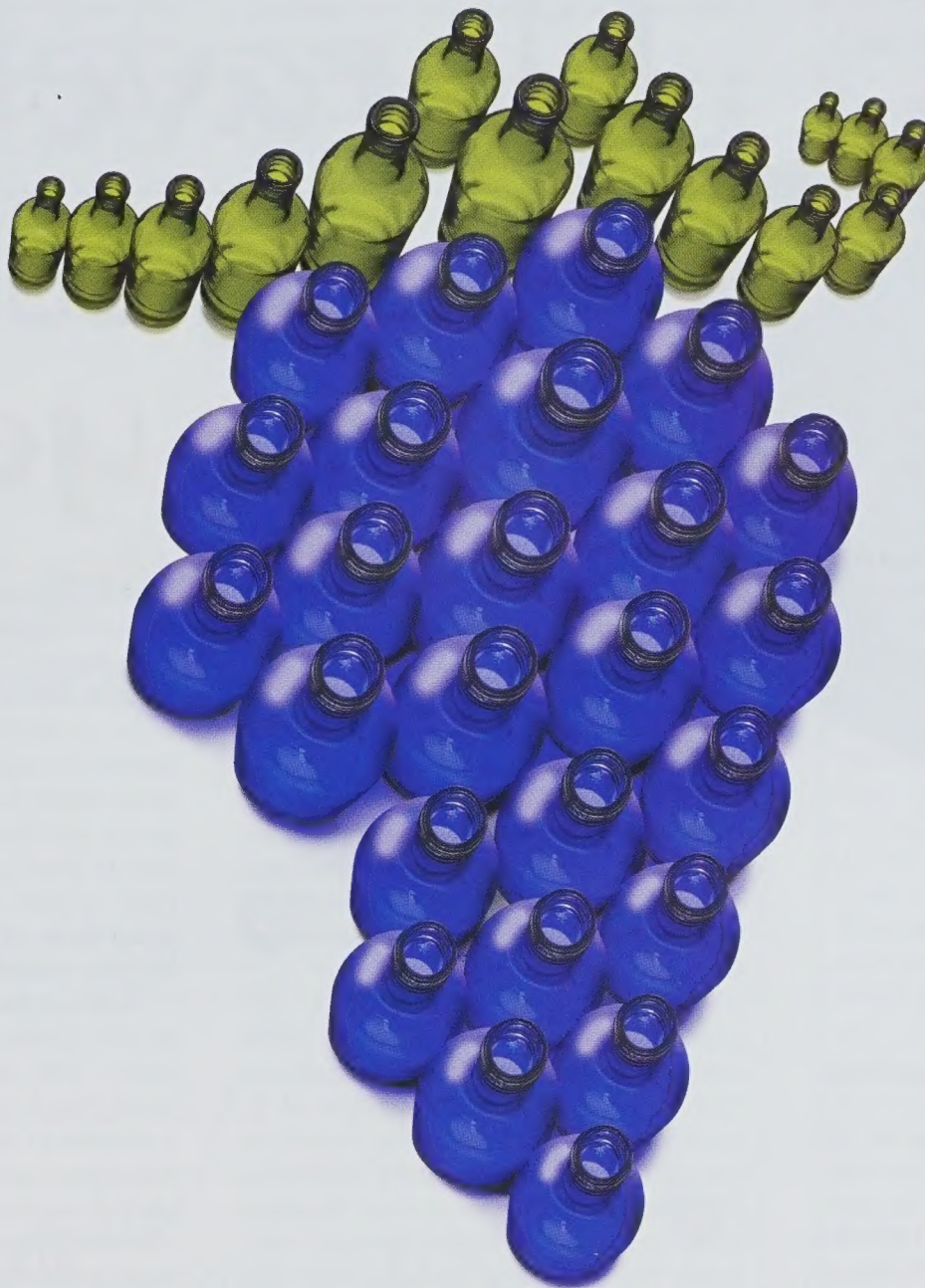
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Cover photo: Yanmar tractor hauling Sauvignon Blanc grapes at Hall Vineyards (Sonoma County)
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WINEMAKING



Unraveling genetic code of wine yeast

BY Anthony R. Borneman,
Angus H. Forgan,
Paul J. Chambers,
Isak S. Pretorius
The Australian Wine Research
Institute,
Glen Osmond (Adelaide), SA Australia

In a world first, scientists at the Australian Wine Research Institute have sequenced the genome of a wine yeast, characterizing the "recipes of life" that shape this winemaker's friend. This work paves the way for development of new yeast strains, potentially leading to innovative solutions to the problem of stuck fermentations, and increasing winemakers' options to sculpt grape juice into wines with desired alcohol levels and flavor profiles.

Most wine yeasts are of the species *Saccharomyces cerevisiae*, but not all *S. cerevisiae* can make wine. In fact, most members of this illustrious species, when added to grape juice, will not complete fermentation and, if they do, the fruits of their labor are not likely to deserve to be called wine. What is so special about wine yeast? Why are so few strains of *S. cerevisiae* able to make wine? Work at the Australian Wine Research

Institute (AWRI) is beginning to find answers to these questions.

In 2008, the AWRI team described their work on sequencing the genome (such as determining, at a molecular level, the genetic make-up) of a wine yeast, and their findings are very exciting. [For a brief description and definitions of genes and genomes, and relationships between the two, see **Cracking the Code — Genes and Genomes.**]

These scientists compared the genome sequence of a wine yeast with previously published sequences of two other non-wine strains of *S. cerevisiae*. One of these two non-wine yeasts is used in laboratory research, in areas as diverse as cancer research and pharmaceutical production, while the other was isolated from the lungs of a AIDS patient. The three strains, therefore, clearly have very different lifestyles, but only one of them makes wine. What is so special about this one?

While all three strains are different to each other, the wine strain stands out as the most divergent of the group. About 0.6% of the letters of the wine yeast genome sequence are different to what is found in the laboratory strain. This may seem like a small difference, but if you consider that genetic differences between humans and chimpanzees amount to only about 1% to 2%, it is really quite large.

Perhaps of greater interest, however, is that there is extra DNA, enough to carry at least 27 genes, not present in the two yeasts it was com-

pared against. In fact, some of the putative genes in this extra DNA do not resemble anything found in other species of *Saccharomyces*; they appear to be more like genes found in very distant fungal relatives. The AWRI team does not yet know how these genes got into wine yeast, but is curious to find out whether or not they play a part in distinguishing wine yeast from other *S. cerevisiae*, particularly in winemaking.

Some of the wine yeast-specific genes encode proteins that are probably associated with the cell wall, a feature of yeast that is undoubtedly important for resilience in inhospitable environments. Will these genes impact on the robustness of wine yeast, a trait which is crucial for completing fermentations? Do these genes, for example, make the yeast more or less vulnerable to becoming stuck or sluggish in a ferment?

We have also identified genes that probably encode proteins associated with amino acid uptake (a neutral amino acid transporter) and metabolism (an aspartate transaminase). Because amino acid metabolism is associated with flavor development, it is tempting to suggest that these genes will impact on sensory attributes in wine, but, of course, this will have to be tested.

Then there are lots of genes with unknown functions, and these might turn out to be the most exciting of all; time and experimental work will tell. There were also some interesting, sizeable rearrangements in the genome, but their significance, at this time, is a mystery.

What does the future hold now that we have this rich source of information on wine yeast? AWRI scientists aim to ascertain, as far as possible, which of the unique features of a wine yeast

genome are important in a winemaking context.

However they also plan to build on data gathered from this project by sequencing and comparing the genomes

CRACKING THE CODE — Genes and Genomes

Genes are recipes for making proteins. For example, your cells carry a gene/recipe for making the protein insulin, which is a hormone that regulates blood sugar level. You also have genes/recipes that instruct your cells how to make proteins that control how tall you can grow, the color of your eyes, the general shape of your body, etc. It is these recipes of life that dictate whether you will have athletic potential or not, and, because you inherited them from your parents you end up looking like them.

If genes are recipes then genomes are recipe books. The human genome carries all of the recipes required for making proteins to build a human body from conception to adulthood, and repair and defend that body during its life. All of our physiology and anatomy is shaped by a collection of 20,000 to 25,000 genes that comprise the human genome. Unless you have an identical twin, your recipe book differs a little from everyone else's.

The language of the genes is very different from the languages we use to communicate with each other. It is based on an alphabet of only four letters (A, T, G, and C) and its lexicon is limited to three letter words, which means there are only 64 words in the genetic dictionary. However this is more than enough to string together sets of instructions for building all of the proteins (enzymes, hormones, muscles, antibodies, cartilage etc.) we require for life.

The "paper" on which the words that make up the recipes of life is written is known as DNA, and when we read an entire recipe book of an organism, decoding what is recorded in its DNA, we say we are *sequencing its genome*. What we end up with in this process is a long sequence of millions of A, T, G, and Cs, with no spaces or obvious punctuation marks, that we have to decipher. Thankfully, sophisticated computational aids can do most of this for us.

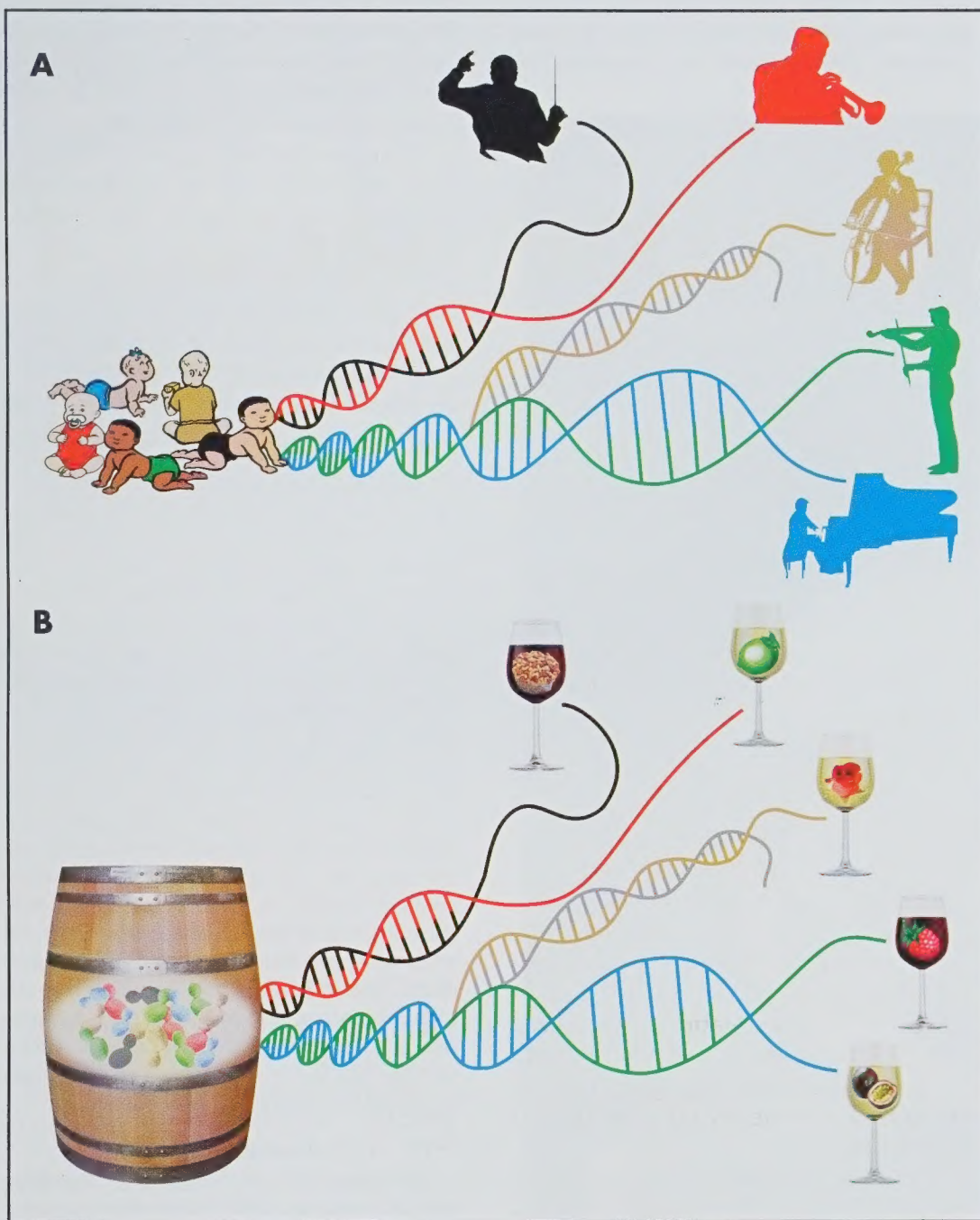


Figure 1. Genetic diversity and wine yeasts — We know from the variation in plants and animals that we see around us that all species of organism, including humans, have genetic diversity. Think, for example, about elite musicians of *Homo sapiens* (i.e. humans). How is it that people such as Luciano Pavarotti, Franz Liszt, and Joshua Bell can produce such unique, outstanding, and award-winning performances? Surely, as we are the same species, couldn't any of us achieve this level with the same training and dedication? Sadly, the answer is probably "no."

Unlike most of us, a "maestro" is born with genetic make-up that provides the inherent ability to reach an elite level in musical performance (illustrated in 'A'). In a similar vein, no two strains of yeast have the same genetic make-up. This is why some wine yeast strains are more robust than others and different strains impart different sensory properties to wines (illustrated in 'B'). Understanding what, in the genome of a wine yeast, determines its robustness and its ability to produce desirable (and undesirable) sensory attributes will enable development of improved strains that will assist winemakers to craft wines for an increasingly demanding and constantly changing market.

WINEMAKING

of several other wine yeast strains that are known to have different winemaking properties. This will enable the team to work out what is common to all wine yeasts (such as what constitutes the core requirements of a wine yeast) and what differences between them drive production of wines with differing qualities

(different propensities to deliver fruity flavors and aromas).

For those readers who might be concerned about genetic engineering, genome sequencing does not generate GMOs. When sequencing genes and genomes, scientists simply extract genetic material (DNA) from an organism to

analyse it; they do not return any of this DNA back into an organism, so nothing is engineered (nothing is reconstructed). It is a bit like taking a biopsy from someone for medical analysis; tissue (such as blood) is removed and analyzed in the laboratory, and never returned to the body it was removed from (or any other body, for that matter). Nothing is engineered or altered in the process.

Once we understand what makes a wine yeast tick, and the significance of variation between wine yeasts, scientists will be much better able to develop strains of this microorganism that can complete fermentation without becoming stuck or sluggish, while producing wines that consumers will be queuing up to buy ■

Acknowledgments

The Australian Wine Research Institute, a member of the Wine Innovation Cluster in Adelaide, is supported by Australia's grape-growers and winemakers through their investment body, the Grape and Wine Research and Development Corporation, with matching funds from the Australian Government. Systems biology research at the AWRI is performed using resources provided as part of the *National Collaborative Research Infrastructure Strategy*, an initiative of the Australian Government, in addition to funds from the South Australian State Government. We gratefully acknowledge the contribution of the *Australian Genome Research Facility*, a member of *Bioplatforms Australia*, where the actual sequencing of the wine yeast genome was carried out. We also thank Sharon Mascall and Rae Blair for editorial assistance, and Jeff Eglinton for preparation of the illustrations. The detailed results of this work are published in the peer-reviewed journal *FEMS Yeast Research*.

Further reading

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VARIETAL REVIEW

CALIFORNIA WHITE RHÔNE-STYLE

Blending away classic blueprints

BY Eleanor & Ray Heald,
Contributing Editors

Blending Marsanne and Roussanne is the chosen white wine in the heart of France's southern Rhône Valley. But in the U.S., winemakers have broken with tradition to make other intriguing combinations.

In this varietal review, *PWV Journal* seeks to discover what white Rhône-

origin varieties are being successfully blended by California vintners, who shun such southern Rhône regional traditions as not blending Viognier with other white grapes.

Typically, in the northern Rhône Valley, Viognier is either not paired or a small percent is blended with the red variety Syrah in Côte Rôtie. It's not grown in the south. In addition to Marsanne and Roussanne in California, Viognier and Grenache Blanc are principal white varieties in a Rhône-style blend.

White blends from the Rhône Valley are generally aromatic with fruit intensity and rich texture. It is much the same in California with Roussanne, Marsanne, and Viognier leading the aromatic profile. Being fairly neutral by comparison,

Grenache Blanc adds acidity to keep the overall blend crisp on the palate.

Specific attributes

The Treana Winery (Paso Robles, CA) 2006 White is a blend of 55% Viognier and 45% Marsanne from the Mer Soleil Vineyard in the Santa Lucia Highlands AVA of California's Monterey County.

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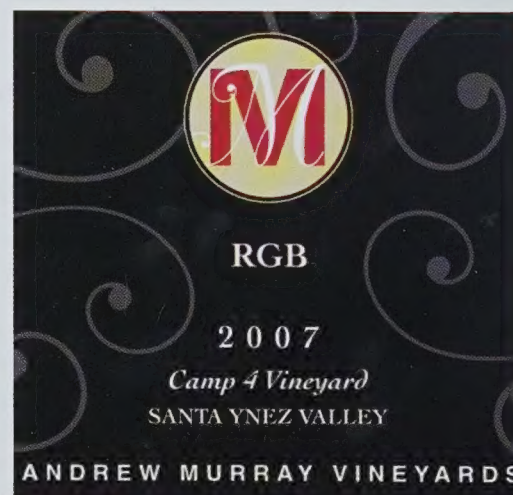
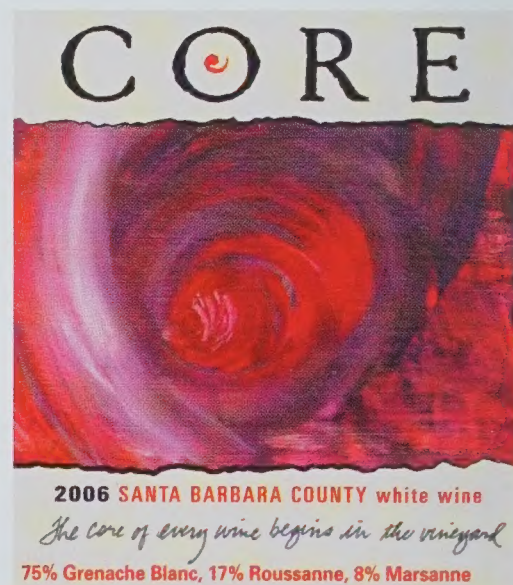
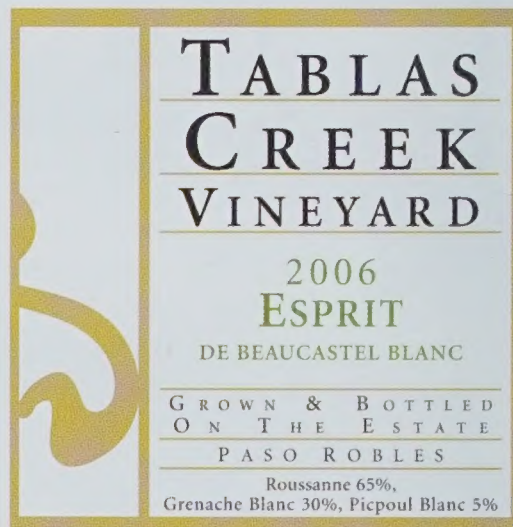
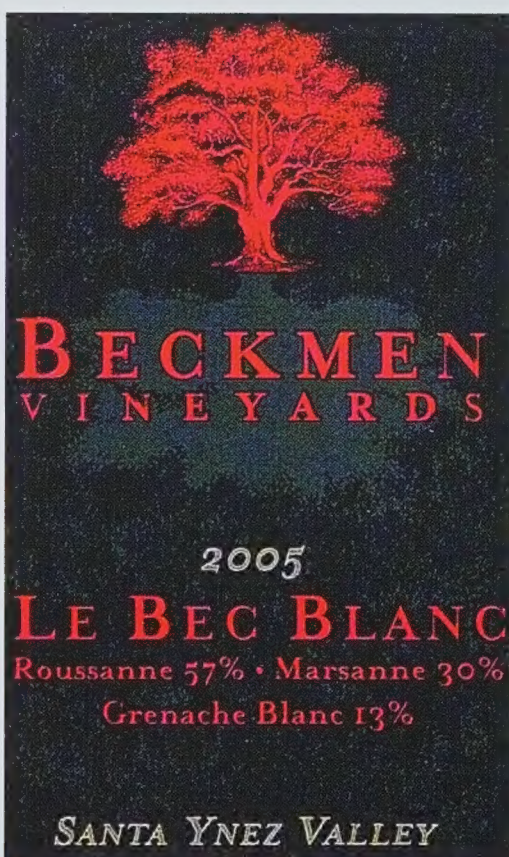
Steve Beckmen,
Beckmen Vineyards,
Los Olivos, CA

Dave Corey, Core Wine Company,
Santa Maria, CA

Ryan Hebert,
Tablas Creek Vineyard,
Paso Robles, CA

Austin Hope, Treana Winery,
Paso Robles, CA

Andrew Murray,
Andrew Murray Vineyards,
Los Olivos, CA



"Typically," says Treana's wine-maker/owner Austin Hope, "Viognier that we source shows a floral nose of honeysuckle and white peach. It's rich with vibrant acidity, but short on finish. Because of greater viscosity, Marsanne offers the wine both weight and balance. It has more honey overtones and is not quite as acidic as Viognier. It adds overall length to the wine."

Beckmen Vineyards (Los Olivos, CA) Le Bec Blanc 2005 contains 57% Roussanne, 30% Marsanne, and 13% Grenache Blanc. "We get more honeyed character in the Marsanne we grow," explains winemaker Steve Beckmen. "There's greater honeysuckle character from Roussanne than Marsanne, which showcases stone fruit and minerality. I agree with Austin's [Hope] explanation of weight and texture."

"Grenache Blanc, although it has chalky tannins, is more in the orange zest, citrus spectrum with some spice hints. Of the three, it contributes the

highest acid with the lowest pH. In some years though, Roussanne has the higher TA."

The Tablas Creek (Paso Robles, CA) 2006 Esprit de Beaucastel is a blend of 65% Roussanne, 35% Grenache Blanc, and 5% Picpoul Blanc. Winemaker Ryan Hebert notes that, early in its life, Roussanne does not have honey notes. It develops with two to three years bottle age.

"The common thread of the Tablas Vineyards," he adds, "is a slight fennel character, particularly noticeable in the Grenache Blanc. Like Grenache Blanc, Picpoul has high acidity, but more tropical fruit aroma and a longer finish."

Andrew Murray Vineyards (Los Olivos, CA) no longer grows its own grapes. RGB 2007 is 60% Grenache Blanc and 40% Roussanne, sourced from Camp 4 Vineyard, owned by Parker Station Vineyards, in the warmer, eastern section of Santa Ynez Valley AVA. Winemaker Andrew

Murray notes that the two varieties have characteristics mentioned by the other winemakers.

Dave Corey (Core Wine Company, Santa Maria, CA) offers principal characteristics of the 75% Grenache Blanc, 17% Roussanne, and 8% Marsanne blend: Grenache Blanc has white flowers and stone fruit aromas, similar to Viognier. Flavors are pear and apple with intensity depending on fruit ripeness. Roussanne aromas showcase pear, apple, stone fruit, honey, and a cheesy character similar to *fromage blanc*. Flavors are stone fruit and honey. A dominant feature is a lush texture. Marsanne has almond and mineral notes in both aroma and flavor.

Vineyard practices

Camp 4 Vineyard in Santa Ynez is an uplifted mesa, not river bottom, yet fairly flat with loam soil. The first crop from this 1,400-acre parcel was harvested in 2003.

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VARIETAL REVIEW



Some Viognier at Mer Soleil Vineyard is grown on a trentina system, similar to a pergola.

Clones are all Tablas Creek and planted, depending on soil composition, on 1103 or 110-R rootstocks. Both Corey and Murray source from this vineyard which has a bilateral cordon VSP trellis.

Tablas Creek Vineyard, a hilly property, is certified organic by the international organization Organic Certifiers (Ventura, CA). "We are not certified biodynamic," Hebert adds, "but we're headed in that direction, focused now on our composting program."

Tablas vineyard elevations range from 1,200 to 1,500 feet with orientation creating either north or south exposure. Soils are calcareous limestone. Depending on matches with clone and soil, rootstocks include 110-R, 140, 1103, and 3309 on a VSP trellis.

"However," Hebert explains, "through trials and experience, we only use 1103

now in limestone soils. White Rhône varieties ripen late. That extends hang time and results in overall better wine."

Beckmen's Purisima Mountain Vineyard has small plantings of Marsanne, Roussanne, and Grenache Blanc. Marsanne is on 3309 rootstock in the lowest part of the vineyard at about 750 feet elevation, which has a sandy soil and southeast exposure.

As elevation rises on hillsides, rootstock changes to 5C in clay loam over limestone. Roussanne is planted in gravelly-clay loam at 1,000 feet and south facing on 5BB. Grenache Blanc is in a block adjacent to Roussanne on 110-R.

Vine spacing is determined by land contour with an average of 1,200 vines per acre. A VSP trellis has three pairs of shoot-position wires predominantly. During the growing season, techniques such as shoot thinning, leaf pulling, crop thinning, and hedging are employed as necessary to insure balanced canopy.

"Vineyard practices are biodynamic, but without certification," Beckmen reports. "We are in the early stages of the formal application process."

In Mer Soleil Vineyard, some Viognier is grown on a trentina system, similar to a pergola and often used for table grapes. "Because of the way the fruit hangs down, it works well in controlling disease pressures that come with the foggy climate of the vineyard location," explains Hope. "Additionally, it controls the amount of sunlight on the grapes."

Other blocks of the variety are either cane or bilateral cordon pruned. Elevations range 400 to 600 feet in soils varying from Arroyo Seco loam to clay loam.

Hope indicates that rootstocks do not make as big a difference with white Rhône varieties as they do with reds. The biggest rootstock problem is with 5C because it resists water uptake.

Beckmen notes that the rootstock match to soil is more important than to the variety or clone. "I prefer to grow Marsanne in sandy soil on 3309," he reports. "Marsanne is vigorous and perhaps the sand limits growth and cluster size, which can be quite large in other soils and on other rootstocks."

Clones

"Clones are limited," Beckmen indicates. "There are a number of selections and some do not have verifiable origins. We've been told that our Marsanne is the Randall (Grahm) clonal selection, but we are not 100% sure of its origin."

Tablas Creek knows the origin of its clonal material is Château de Beaucastel in France's southern Rhône. "Since Viognier is not grown there," Hebert reminds, "Tablas clonal selection originates from Condrieu."

The majority of Roussanne grown in California is the Tablas Creek clone.

Balancing crop load for maximum flavor

"With white Rhône origin varieties," Beckmen contends, "we're dealing with distinctly different situations. We struggle to get a crop with Roussanne and take whatever the vines give us, which in most years is

one ton or less per acre. We have spur-pruned, cane-pruned, and head-trained vines.

"Head-trained vines yield minimal fruit. Cane pruning has a significant number of blind buds and it is a challenge. Spur-pruned seems to be best, yet we still struggle with producing a better yield even though we've applied a lot of compost, worked the soil, and been diligent in selecting cover crops."

Beckmen cites Grenache Blanc as a vigorous producer, and like the red Tablas Grenache, can set a big crop. Serious fruit dropping before veraison is needed to control yield. Its positive attribute is even growing. Marsanne sets bigger crops and it requires some thinning every year. With 10x5 spacing, it bears 12 clusters per vine.

At Tablas Creek, there's no need to drop fruit with Roussanne, which yields 2.5 to 3 tons per acre. Dropping

crop immediately after fruit set is necessary with Grenache Blanc. Marsanne fruit is also dropped following fruit set to achieve 3 tons per acre. If not cropped, it would yield 6 tons per acre.

Picpoul is self-limiting at 1.5 to 2 tons per acre. In order for Viognier to produce more fruit than one ton per acre, cane-pruned Double Guyot was chosen. It boosted yield to 2 tons per acre.

Irrigation

Hope indicates that, in general, white Rhône varieties do not need significant irrigation. Viognier, which is usually harvested in October, is a fairly vigorous vine and needs, perhaps, 3 to 4 hours per week. Although it grows a lot of foliage, Marsanne requires about the same amount of irrigation. It is harvested in late October into November.

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VARIETAL REVIEW

sections of vine rows at Purisima Mountain Vineyard. Because of struggles with Roussanne, Beckmen has gone to long, deep soakings. Yet, Marsanne in the adjacent block is managed with deficit irrigation.

Because Marsanne is planted on both sand and clay, the regimen is different

because the clay soil does not need as much water. Sandy soil needs more frequent irrigation with shorter sets. "We water Marsanne in clay about half as much as we water the variety in sand," Beckmen reports.

"The starting date of irrigation depends on the year. In 2006, we did

not irrigate at all, even sandy soil plantings. In 2007, we began irrigation in April. In 2008, soil began drying out two months after that."

Beckmen irrigates up to harvest. Roussanne is given a "big shot" (15 to as much as 25 gal per vine) near the end of August to carry it through to November when grapes are picked.

Tablas Creek's situation is a little different because the vineyard gets 25 to 30 inches of rainfall annually, twice as much water as nearby Paso Robles. Irrigation is in place if normal rainfall does not occur. "We will not kill our vineyard attempting to dry farm," Hebert says. "In some vintages, we do irrigate once in July, but cut all watering at veraison. We irrigate again after all the fruit has been harvested."

Picking judgments

"Marsanne is for those who can't ripen Roussanne." That, according to Hebert is a favorite saying of Tablas Creek's French partners (owners of Château de Beaucastel). "When you get Roussanne ripe," Hebert adds, "it's a more interesting variety."

More than taste, Beckmen indicates that there's a visual look to ripe grapes. Although designated white, there is color. Roussanne and Marsanne grapes change from green to almost brownish, while the Grenache Blanc turns golden and orange.

Grenache Blanc, according to Hebert, has skins that become translucent as they go through veraison. In sunlight, seeds inside the berries are visible and turn brown as ripening occurs. "If we harvest Grenache Blanc and the skins are not orange or browning," Hebert remarks, "then we picked too early."

"In some years, we do the first Roussanne picking at the end of August and then run through the harvest season, picking each block as many as four or five times. But that's the only variety that requires it. Independent of picking time, Brix, TA, and pH are virtually the same."

Roussanne harvest at Tablas Creek has the first picking of clusters that are golden brown. Clusters on the inside of the fruit zone may

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VARIETAL REVIEW

still be green and those are allowed to hang for another three to four weeks.

Tablas Creek harvests each variety separately. "Because we do blends," Hebert stresses, "the more distinctive lots we have in the cellar, the better the wine. Lately, we've been picking at lower sugars to tame alcohol (high 13% to no more than 14%) in the finished wine."

Core judges maturity by tactile clues such as berry softening and often picks varieties at the same time.

He contends that opposite sides of the vines have different flavors due to dissimilar sugar levels and pH.

Since Beckmen's Roussanne is not as ripe as he'd like, he relies on higher Grenache Blanc ripeness to create a balanced blend.

Murray seeks to pick Roussanne fairly ripe (25° Brix) so prefers late-season irrigation. "Camp 4 vineyard is warm," he indicates, "and grapes

are harvested with some shrivel when not irrigated."

Beckmen notes, "Roussanne at Camp 4 looks completely different than what I grow at Purisima, yet the vineyards are only four to five miles apart."

"That's why Camp 4 needs irrigation while the flavors are still accumulating," Murray reiterates. "Roussanne is a complete enigma. I taste it in the vineyard and see it turn color. I pick it and when I run numbers on the juice back at the winery, it can be 26° Brix, but lacks flavor."

"It's unlike Viognier which changes from uninteresting, to sort of interesting and then to 'holy cow' this is beautiful. We use Grenache Blanc to keep the pH in check."

In the Beckmen cellar

Roussanne is harvested between 24.5° and 26° Brix, TA of 4.5 to 5.5 g/L, and 3.6 to 3.8 pH. For Marsanne, Brix

range is 23° to 24°, TA 3.5 to 4.0, and 3.5 to 3.6 pH. Grenache Blanc range is 24.5° to 25.5° Brix, with 4.0 to 4.5 TA, and 3.4 to 3.5 pH.

First SO₂ addition at the crush pad is 30 to 50 ppm. Prior to 2007, yeast cultures GRE and D254 were used for a fermentation lasting two to three weeks with a peak fermentation temperature of 68°F. Now, 90% of white-Rhône varieties undergo an uninoculated fermentation which Beckmen says adds more weight and richness to the wines.

Barrel fermentation occurs with Grenache Blanc and Marsanne in the oldest, essentially neutral, cooperage. Roussanne and Marsanne lees are stirred once per month. Wine is not inoculated to initiate malolactic fermentation (MLF).

Fining is done with isinglass and gelatin and the wine is sterile filtered before bottling.

Continued on page 56



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LAKE COUNTY

Environmentally-friendly practices, high elevation, and favorable climate reduce pest pressures

BY Erica Lundquist, consultant,
Glenn McGourty, University of
California Cooperative Extension

There are many noteworthy efforts to improve sustainability and environmental stewardship among different California winegrowing regions. Located in the mountains north of Napa County, Lake County winegrowers use fewer pesticides and more low-

risk crop protectants than other winegrowing regions in the North Coast and California.

The climate of Lake County is very favorable for wine grape production but not for diseases and pests. The region has many new vineyards that are designed and managed by experienced growers. There are also well-educated crop consultants knowledgeable in environmentally-friendly integrated pest management (IPM)

Zinfandel vines in the Madder Lake Vineyard above the east end of Clear Lake (1300 foot elevation), spaced 7 x 5. Tractor rows are mowed once a year in the NO-till vineyard. A Landini or Yanmar crawler tractor with minimal compaction is used in the hillside vineyard and a weed whacker is used to knock down weeds in vine rows.

practices to assist growers in pest management decisions. There are many activities in the region to educate growers on sustainable practices:

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Common annual grasses and forbes in the Beckstoffer Amber Knolls Vineyard of Cabernet Sauvignon include Soft chess (*Bromus hordeaceus*), Common vetch (*Vicia sativa*), Crimson clover (*Trifolium incarnatum*), and Rose clover (*Trifolium hirtum*).

1. Under the leadership of the Lake County Winegrape Commission (LCWC), over 75% of Lake County growers have completed the Code of Sustainable Winegrowing Practices Self-Assessment Workbook.

2. During the rapid expansion of the vineyard business in the 1990s, an Erosion Prevention Education Committee was formed as part of a permitting process that required all new vineyard developments to submit plans for a no-fee county permit that included consultation with the committee composed of: two LCWC growers with large acreage, two LCWC growers with small vineyards, an at-large community member interested in environmental conservation, the UC Winegrowing Farm Advisor, and the NRCS Soil Conservationist. The purpose of the consultation was to encourage the use of Best Management Practices (BMP's) to prevent soil erosion, and conserve native vegetation and habitat.

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3. Improving water quality by funding cover crop research with UC Cooperative Extension (see "Performance of 18 Cover Crop Species in New High Elevation North Coast Vineyard," *PWV* Sept/Oct 2006); holding well-attended tailgate meetings on Best Management Practices to prevent soil erosion; and conducting a Vineyard Water Quality Planning Short Course (a joint effort between UC Cooperative Extension, Mendocino College-Lakeport Center, and the Lake County Farm Bureau) on water quality issues and help growers prepare water quality plans for their vineyards. Forty producers participated in the effort.

4. From 2002 to 2007, the LCWC organized and funded a sustainable winegrowing education program with five to ten meetings each year that covered irrigation, soil fertility, canopy management, and many aspects of pest management.

5. Funding of ongoing research with UC Cooperative Extension to develop "Soft, Safe, and Sound" integrated pest management practices that reduce pesticide use by creating in-vineyard habitat while protecting soil from erosion, reducing dust, choosing "least toxic" materials if spraying is needed, and augmenting predatory mite populations.

6. Working with the Lake County Air Quality Management District to help the region maintain its position as having the cleanest air in California by reducing dust (cover cropping and minimizing sulfur dust applications) and minimizing agricultural burning (chipping and shredding vineyard waste).

7. Lake County growers have a commitment to alternative farming practices. There is more than 500 acres of certified organic and biodynamic vineyards in the region. The LCWC has also conducted tailgate meeting and seminars on organic winegrowing, partnering with the California Certified Organic Farming "Going Organic" program and UC Cooperative Extension.

More than 100 growers in the Lake County region are taking a very proactive approach to sustainable and environmentally-friendly farming practices. A recent review of pesticide use reports and testimonies from individ-

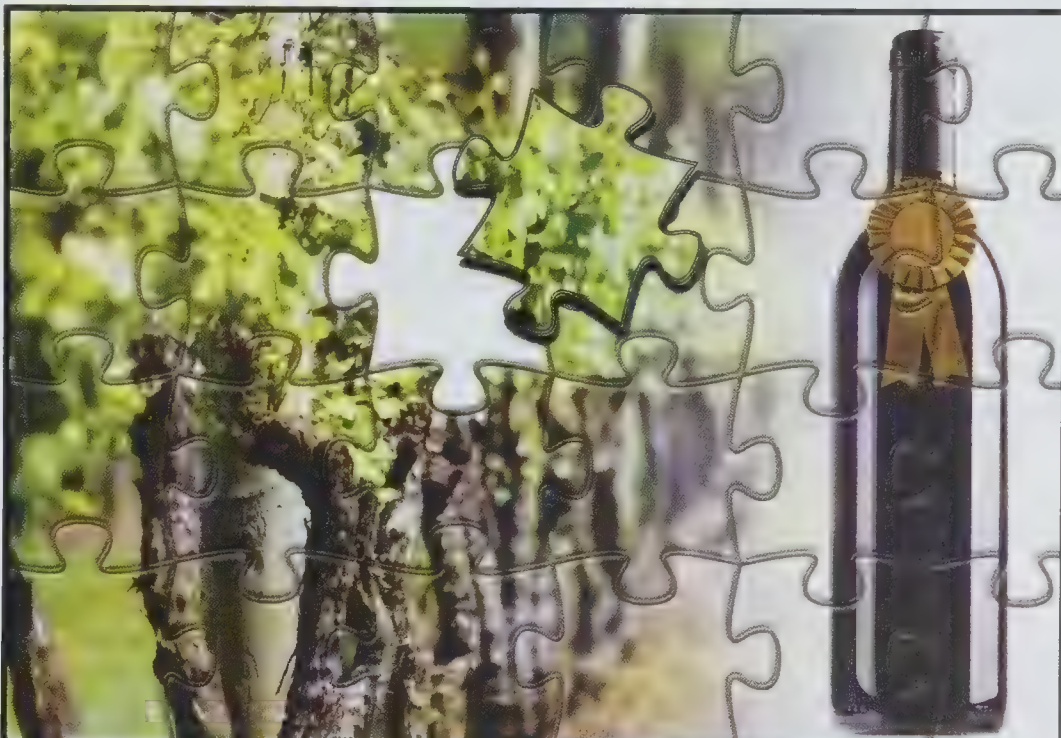
ual Lake County wine grape growers help explain how Lake County growers keep pesticide use low.

Climate

During the growing season, Lake County's elevation (mostly above 1,300 feet) and crystal clear and dry air lead to

diurnal temperature swings in most locations (between 40 to 50°F most days). This temperature pattern is less favorable to development of powdery mildew as measured by the UC Davis Gubler-Thomas powdery mildew risk assessment index.

Winters are cold and relatively wet (averaging 35 inches of rain around



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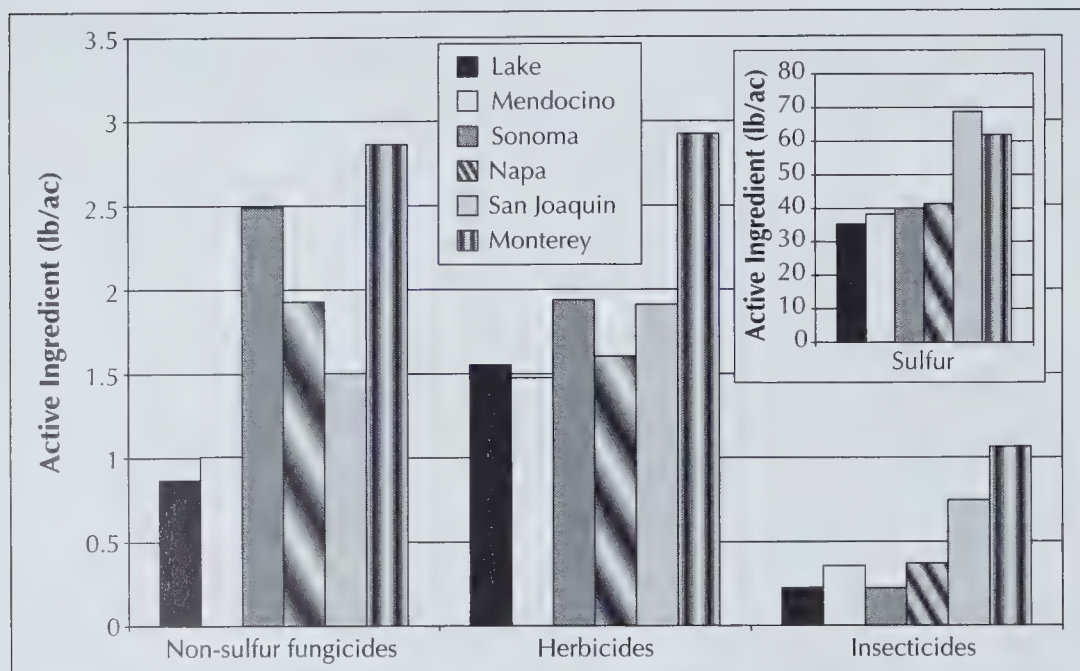


Figure 1. Average winegrape pesticide use for 2002-2004 in several pesticide categories for Lake, Mendocino, Napa, Sonoma, San Joaquin and Monterey Counties.

Clear Lake and up to 70 inches in higher elevation areas). Problem pests

and diseases that plague adjoining winegrowing regions have not been

detected in Lake County, including Pierce's disease, glassy winged sharp shooter, light brown apple moth, and vine mealy bug (males have been detected in traps but no females have ever been found).

There are other Lake County factors that reduce pest incidence and pest management costs. "Cold winters knock out some pests, and budbreak is later, leading to a shorter growing season," explains Peter Molnar (Obsidian Ridge Vineyard).

Integrated Production

Lake County growers have the goal of farming balanced vines that are not excessively vigorous (which predisposes the fruit to vegetative flavors, the canopy to leaf hopper damage and fungal diseases) or stressed (causing unbalanced ripening, shriveled fruit, and mite attacks on vines) as the foundation of their pest management program.

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Cultural practices to dissuade disease include trunk- and cordon-suckering, shoot-positioning, and leaf-pulling. Self-reseeding annual cover crops are widely planted to prevent soil erosion and reduce dust in the summer, and provide habitat and biodiversity for predators and parasitoids.

Growers work closely with crop consultants to avoid spraying insecticides or any other materials that will actively disrupt predator/prey relationships. Many growers are trying to remove sulfur products from their disease control program to encourage predatory mites and reduce any off-aromas during fermentation.

Fungal disease control

The annual average applications of sulfur in Lake County is 35 to 40 lbs per acre (Figure I). Lake County growers take an IPM approach to disease management. Many growers use the UC Davis Gubler-

Thomas powdery mildew risk assessment index to schedule powdery mildew control. Dr. Doug Gubler, UC Extension Plant Pathologist, has worked closely with Lake County growers to educate them on how to use the powdery mildew risk index, and suggest the use of new materials to reduce sulfur use.

Lake County growers have access to local powdery mildew indices and weather information through a publicly-available Lake County Pear and Grape Network of weather stations. (This network is a cooperative effort between UC IPM, UC Cooperative Extension, Lake County Air Quality Management District, the Lake County Department of Agriculture, and three growers who own five weather stations.)

Information is available to growers for disease forecasting, air dispersion, fire hazard, fruit frost hazard, and general weather data. Any grower can access the web-based network at no cost. The LCWC pays for year-round

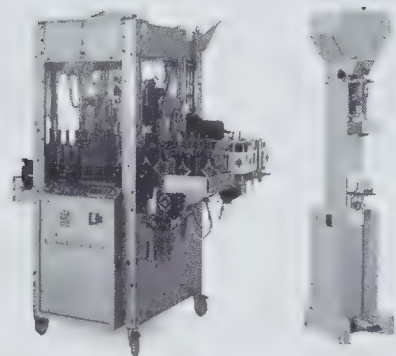
weather forecasts and growing season ET (evapotranspiration) forecasts available on the website.

Several growers emphasize the importance of vine balance and maintaining an open canopy for disease management. Walt Lyon (longtime winegrape grower in Big Valley) has 45 acres of Syrah and Sauvignon Blanc on a lyre trellis that allows the shoots to grow out at an angle rather than positioning them vertically. This promotes air circulation and requires little or no leaf removal. If grape clusters are piled on top of each other, the fruit is thinned so that no clusters touch each other to prevent botrytis.

Peter Molnar has experience with a high elevation Lake County vineyard and a cool, coastal vineyard. His 105-acre Obsidian Ridge Vineyard is at an elevation of 2,350 to 2,640 feet in Red Hills, and his family also has a vineyard in Carneros along the Napa River. The varieties grown are suited

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to the two locations: Cabernet Sauvignon, Syrah, Cabernet Franc, and Petite Verdot in Red Hills; Chardonnay and Pinot Noir in Carneros.

For powdery mildew control in Red Hills, Lake County, Molnar avoids sulfur dust to prevent spider

mite outbreaks and applies JMS Stylet-Oil early in the season and wettable sulfur for powdery mildew control pre-bloom.

"We make two to three fewer powdery mildew applications per season in Red Hills compared to Carneros," reports Molnar. With a hillside vine-

yard location, canopy growth is limited by gravelly soil conditions, permitting better air circulation and reducing costs for leaf removal compared to Carneros.

The Carneros vineyard has substantial Pierce's disease pressure. Molnar has made efforts, at great cost, to limit Pierce's disease damage. Lake County, on the other hand, has never demonstrated a conclusive Pierce's disease find. With a few vineyards at 900 feet elevation and most winegrape growing above Clear Lake at 1,300 feet, winter in Lake County is colder than in many grape growing regions, possibly preventing the Pierce's disease causal agent *Xylella fastidiosa* from establishing a foothold.

Balanced nutrition for healthy vines

David Weiss (owner of Bella Vista Farming Company), emphasizes balanced vine nutrition to avoid pest and disease pressure. His own vineyards and those he manages total 300 acres of Sauvignon Blanc, Gewurtztraminer, Reisling, Zinfandel, Petite Sirah, Cabernet Sauvignon, Cabernet Franc, Syrah, Merlot, Petite Verdot, and Tempranillo.

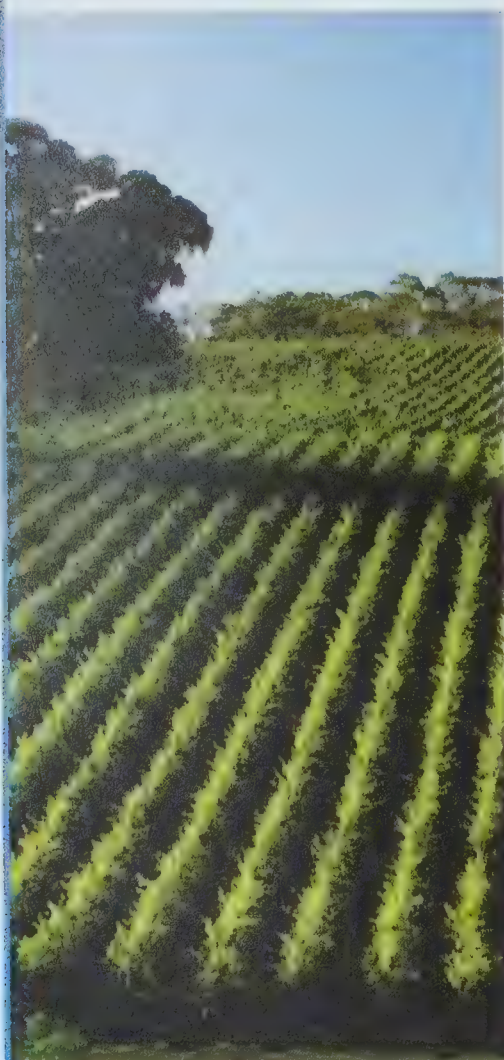
Mike Boer, of Ag Unlimited, helped Weiss develop a vine nutrition program. Boer's approach is to ensure plenty of plant-available potassium, calcium, and phosphorus that will minimize leafhopper and mite pressure. At the same time, this program maintains better vine health in the presence of phytophagous nematodes and oak root fungus, according to Boer. Weiss credits the fertility program and canopy management with eliminating the need for Botrytis sprays since 1999.

Soil tests help Boer to adjust the fertility program for each block. His recommendations depend on the soil. Lake County soils range from high magnesium/low potassium soils in locations influenced by serpentine minerals to high potassium soils in volcanic areas.

Soil amendments are an important part of a sustainable farming approach to improve soil physical qualities and soil fertility.

A typical amendment program will include fall application of four tons per

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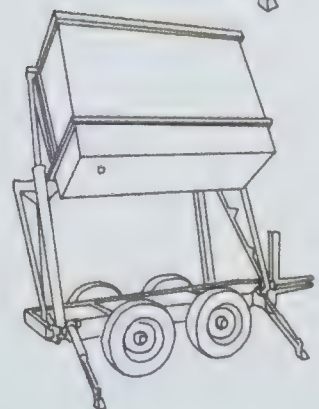
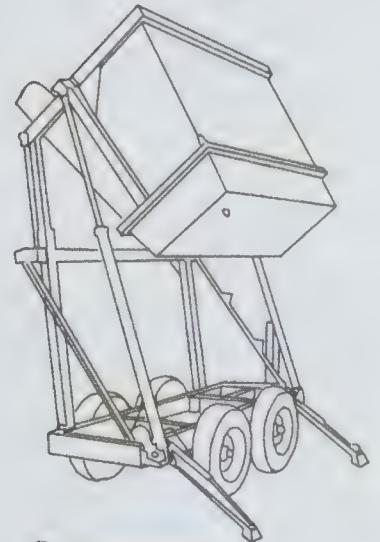
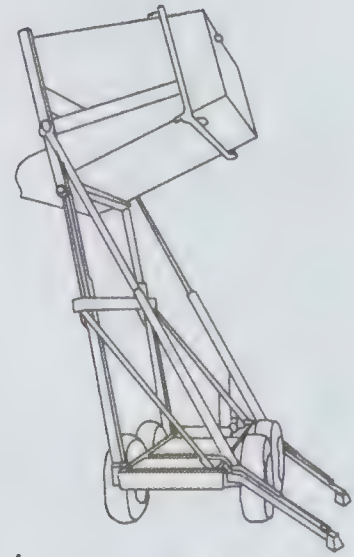
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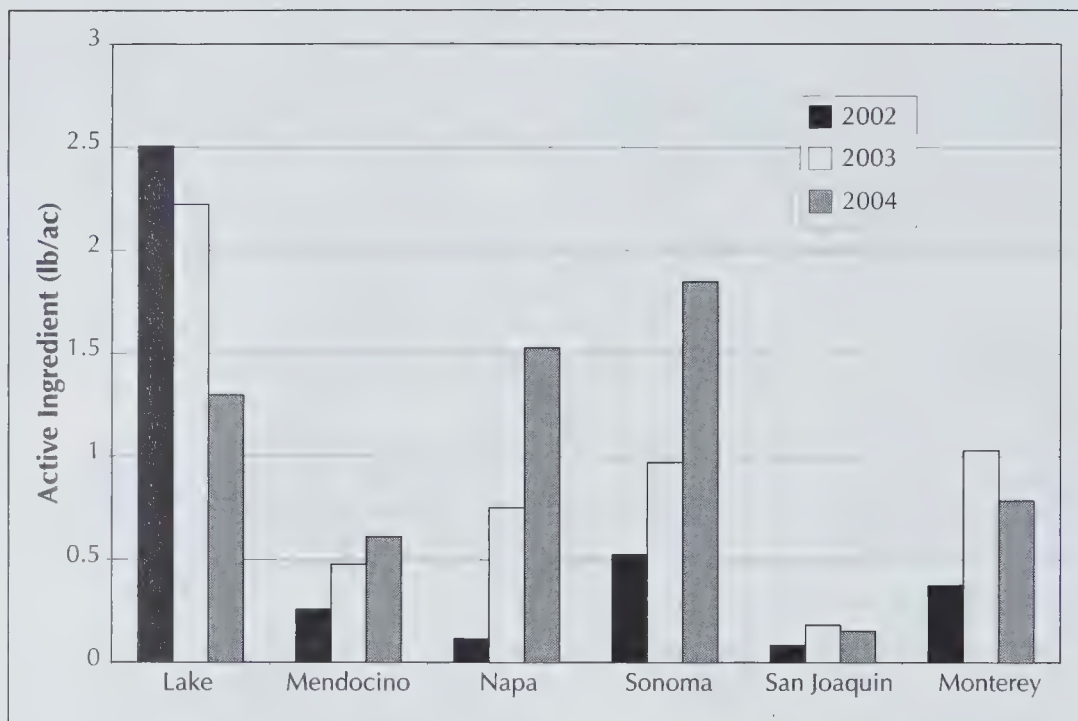


Figure II. Application of horticultural oil for the years 2002, 2003 and 2004 in Lake, Mendocino, Napa, Sonoma, San Joaquin, and Monterey Counties.

acre of compost (50% winegrape and pear pomace and 50% animal manure), and one ton per acre of lime or gypsum by broadcast-application to the vineyard floor. When needed, micro-nutrients, including zinc, boron, iron, manganese, and copper are applied in early season fungicide sprays.

While compost application might seem expensive, "Where multiple nutrients are needed, it becomes cost-competitive," explains Boer. The compost builds long-term soil nutrient availability, eventually eliminating the need for most drip-applied nutrients.

Boer emphasizes the need to track changes using soil tests: "Eventually compost and amendment rates will be reduced, eliminated, or applied infrequently as needed." Compost also benefits cover crops which can make small contributions of nitrogen to the vineyard soil.



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Weed control

When looking at total herbicide use, Lake, Mendocino, and Napa Counties apply very low annual rates (Figure I). This may be due to organic growers and an increasing number of conventional growers who use mechanical weed control. Lake County growers confirm that many herbicide programs are based primarily on Roundup. Pre-emergent herbicides with high-leach potential are avoided.

With 115 acres of vineyard in Big Valley, 58 of which are in transition or certified organic, Steve Devoto relies primarily on cultivation for weed control. Devoto uses a Pellenc Sunflower in-row cultivator, and if the soil has dried and become too hard, he uses a Bianco cultivator. He has found that the cultivators are hard on vines under two-years-old. In newly planted blocks, sturdy stakes are used to allow cultivation without damaging vines. In some conventional blocks, glyphosate is sprayed for weed control.

Weiss farms both conventional and organic vineyards. For organic weed management, a combination of hoe-plowing under the vine row and disking in the tractor-row is done. In the spring, a hoe plow moves soil out of the vine row. After several weeks, the tractor rows are disked, and, at the same time, soil is thrown back into the vine row to cover weeds that have emerged since the hoe plow pass.

After harvest, soil amendments are applied, and disking throws more soil into the vine row.

Conventional blocks are managed the same way, or vine rows are sprayed with glyphosate supplemented with a low rate of Goal or Chateau for improved control. Weiss has been able to reduce weed sprays to one per year in some conventional blocks.

Insect / Mite control

The experience of Lake County winegrowers confirms relatively little need for pesticides to control leafhoppers and mites (Figure I). Only the grape leaf hopper *Erythroneura elegantula* is found. The parasitic wasp of the leafhopper *Anagrus epos* is widely distributed.

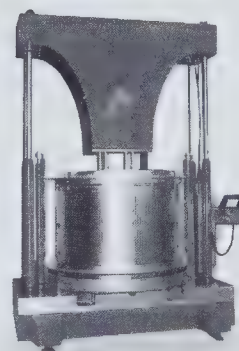
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Since growers try to keep the canopies in balance, this helps in their integrated approach to managing leafhoppers and often there is no need to spray to control this pest.

Many growers, in valley locations where vines are more vigorous, treat for leafhoppers or mites only every

second or third year, and even then, only on 5% to 20% of their vineyard acreage. In upland vineyards, many growers have never sprayed for leafhoppers. Machine-harvesting has enabled many growers to avoid spraying for leafhoppers that would be a nuisance to pickers.

In hillside locations, spider mite infestations are more common than in valleys. Taking an IPM-approach, growers focus on reducing dust by planting self re-seeding cover crops in a no-till management system, and applying dust suppressants to roadways. Some growers have had good success releasing *Galendromus occidentalis* predatory mites.

North Coast counties are fortunate to suffer little damage from *Lepidopteran* (moth) pests such as omnivorous leafroller and orange tortrix, which are more serious problems in warmer regions.

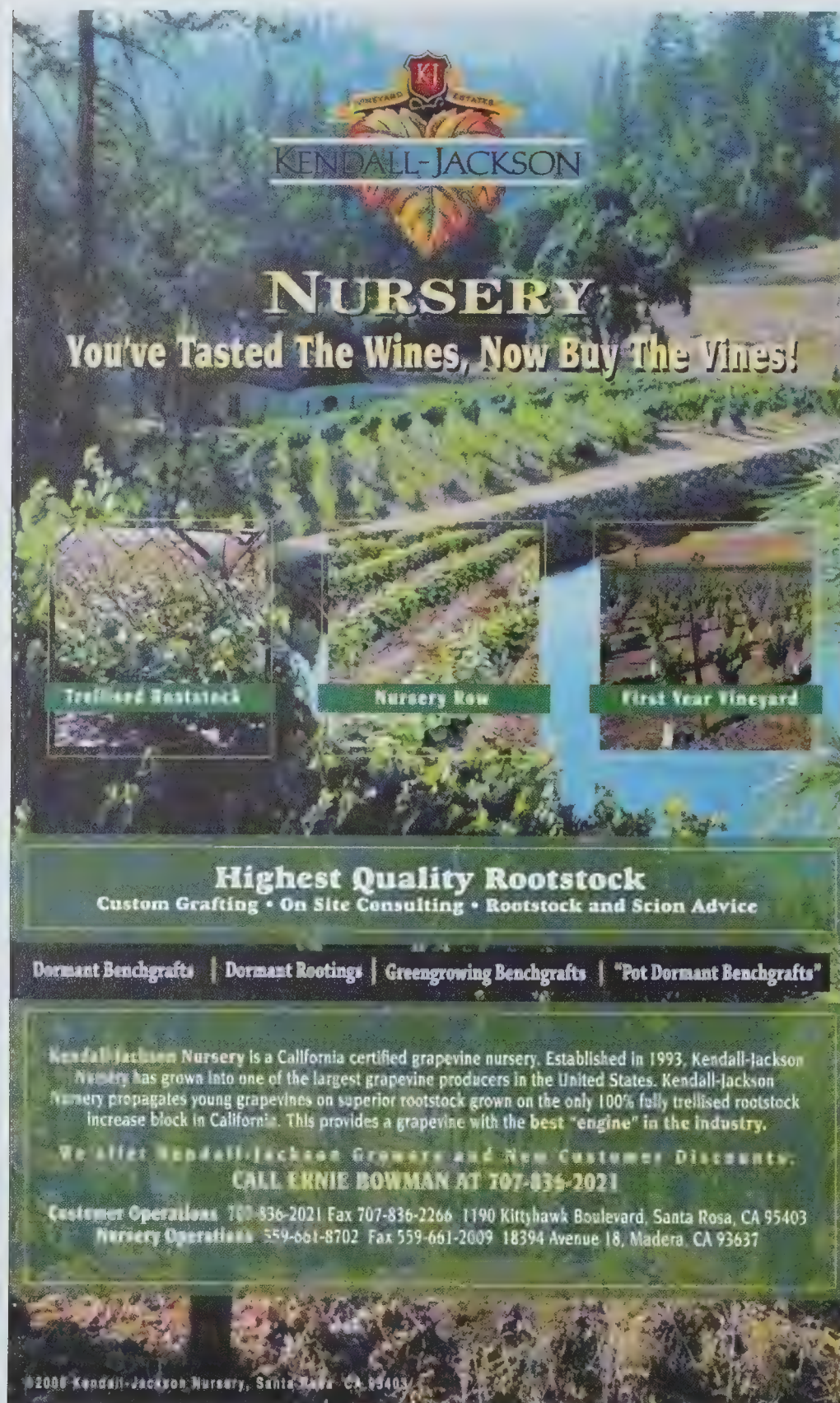
Promoting biological control

The IPM program at Beckstoffer Vineyards (500 planted acres of red wine grapes, primarily Cabernet Sauvignon, planted on rolling, volcanic terrain of the Red Hills Lake County AVA) is to avoid chemicals that disrupt natural pest control or practices that promote a flare up of pests, including control of powdery mildew and spider mites.

Randy Krag (Beckstoffer vineyard operations manager), credits Frank Anderson (recently retired general manager), with a philosophy of minimizing pesticide application. The slope of the hillside vineyards has dictated a no-till vineyard floor management approach to prevent soil erosion which also reduces dust. Main avenues within the vineyard are graveled and/or treated with dust suppressants.

To avoid a potential increase in spider mite populations, Krag makes no more than two sulfur dust applications per season for powdery mildew control in any block. Powdery mildew control starts with one application of JMS Stylet-Oil, which controls both powdery mildew and mites. This spray is combined with a sterol inhibitor or DMI-fungicide, and is followed by a rotation of fungicide chemistries throughout the season. Products include Flint, Elite, and Quintec.

Since planting of Cabernet Sauvignon in 1999, Beckstoffer Vineyards (Red Hills) has applied no chemical miticide beyond one early season Stylet-Oil application, instead augmenting natural control with preda-



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tory mites, *Galendromus occidentalis*. In June (post-bloom), mites are released at a rate of 2,000 per acre. Krag takes delivery of bean plants in small lots, so that the mites can be applied between 6 and 9 AM, before the bean plants (containing the mites) dry out.

Working with UC Cooperative Extension on an experimental basis, Krag has eliminated sulfur completely from the powdery mildew control program, released predatory mites, and applied only 22 ounces of fungicide for the entire growing season with no mite problems or detectable powdery mildew. No insecticides or miticides are used in the trial blocks.

While field-monitoring has not convinced Krag that inoculative predatory mite releases are necessary, it appears to confirm that avoiding disruption of natural control is important. "I see some blocks with lots of predatory mites and no spider mites, so perhaps there is an

alternate food source for the predatory mites. I have also seen predation by six-spotted thrips."

Several years ago, the grape leaf-folder arrived at Beckstoffer-Red Hills. Lucia Varela (UC North Coast IPM Advisor), encouraged Krag to hold off on chemical control. She advised Krag to be on the lookout for a *Brachonid* wasp parasite. "2007 was the first year that we saw widespread parasitism by a *Brachonid* wasp" reports Krag.

Horticultural Oil application

Stylet-Oil is another tool in Lake County's sustainable winegrape pest management strategy that can be applied for mildew and mite control. Stylet-Oil is typically applied early in the season to control both powdery mildew and spider mites, beginning shortly after the leaves are open (Figure II.).

In hillside vineyards, both Beckstoffer Vineyards and Obsidian Ridge

Vineyard apply oil in early season sprays, however in valley locations, where mite outbreaks are less frequent, oil is seldom applied.

Cover Crops

All surveyed growers have cover crop strategies. Besides protecting soil from erosion and suppressing dust, cover crops increase habitat diversity and food sources for biological control agents and their alternate prey.

In Big Valley, Walt Lyon encourages natural predators with a legume-grass cover crop in alternate tractor-rows. The cover crop is mowed in the late spring (May) to maintain habitat for beneficial insects.

In valley locations, David Weiss has seeded a legume-grain mix to add nitrogen and build soil organic matter in developing vineyards. In established vineyards, a *Brassica* mix cover crop is seeded in alternate tractor-rows to repel phytophagous

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nematodes. All cover crops are disked early in the growing season (April or May).

Steve Devoto seeds a *Brassica* cover crop mix in blocks where he suspects nematodes could be a problem. In other blocks, cover crops are mowed in tractor-rows, only tilling in the vine row.

Almost all hillside Lake County vineyards are managed no-till with a cover crop in the tractor-rows to prevent soil erosion and strip sprayed in vine rows to prevent erosion and control weeds.

At Beckstoffer-Red Hills, the no-till annual cover crop is fertilized in the fall with a balanced fertilizer to promote biomass production and enhance erosion control. After it is mowed in April, the annuals dry out in the well-drained soil. Since seeding during vineyard development, the cover crop composition has self-

selected to include rose clover, crimson clover in wet years, and annual grasses such as soft chess, ripgut brome, and Italian ryegrass.

Conclusion

Lake County's sustainable pest management can be credited to two factors: the favorable mountain climate, and grower commitment to sustainable pest management.

The PUR data and interviews show that Lake County winegrowers use a very low amount of pesticides among California wine growing regions. Use of cultural practices including canopy management and cover crops to reduce pest incidence is nearly universal. Increasingly, growers are adopting approaches such as tillage for weed control and promotion of natural pest control to eliminate or greatly reduce chemical use.

Pesticide Use Report (PUR) Data Base

In 1990, California's pesticide use reporting program was developed to insure that pesticide use can be easily tracked by commodity, product, and county. It is the most comprehensive in the world. Under the program, all agricultural pesticide use must be reported monthly to the county agricultural commissioner, who in turn, reports the data to the California Department of Pesticide Regulation (DPR). The data is then tabulated, summarized, and made public. The data base can be accessed by anyone with web access and fairly complex reports can be generated. The data base was used to generate the information used in the graphs in this article. For more information, go to this web address: www.cdpr.ca.gov/docs/pur/purmain.htm.

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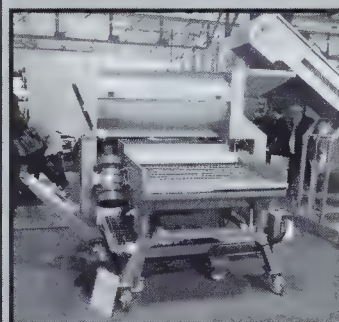
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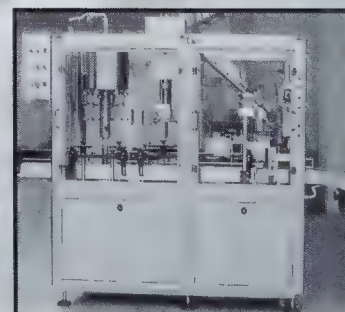


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Build a high-performing team and a more productive business



BY Rosemary Richardson, *Associate, Scion Advisors*

Conflict is simply what happens when people with **different perspectives** try to accomplish something that requires them to work together ... to cooperate. How you manage conflict can be a significant factor in building your business faster, with more effective and longer lasting results. Instead of avoiding conflict, learn to embrace it in order to align people, solve your business issues, and move forward.

High performing teams that leverage their differences and encourage different perspectives can find innovative solutions to challenges. Honest and vigorous discussion allows everyone to have a voice at the table. Research proves that when people know their own ideas are carefully considered they are more committed to the execution of business strategy. How well your team works together and engages in problem solving become fundamental drivers of business profitability.

Business advisors and coaches are called on more and more to help winery owners shape high-performing teams capable of building businesses that are worth more. This article provides the core concepts behind productive conflict and brings these to life through two case studies. These illustrate how wine business owners can manage conflict and deliver higher productivity in a crowded, competitive, and global wine industry.

Family businesses in transition — fertile landscape for conflict?

It is possible, and highly probable, that you will have organizational conflict at each growth stage of your business, whether you are moving from startup to formalization or moving to maturity (see **Stages of Family Businesses**). In startup mode, roles are not well defined. Everyone is in each other's sandbox, without being aware that they are.

A business in formalization or expansion mode — a period of learn-

ing new skills and increased financial management demands — is ripe for conflict. This is when family members, employees, and those in strategic relationships need to start debating what markets to pursue, how to organize, when decisions should be made, and who should make them.

A mature business can face conflict when multiple owners are contemplating a potential exit strategy through sale. For this to happen successfully, the ownership group must be aligned against a common set of expectations and goals. They need to agree on what it will take to get the business ready for sale to a targeted buyer profile.

Conflict tends to show up between organizations or factions who are competing for resources. Wrought with uncertainty, risk, and emotion, each transition from one business stage to another is fertile ground in which conflict can flourish.

How to navigate transition and manage conflict

What differentiates successful transition from failure? Winning executives know they have to go back to basics: define success, develop clear strategy, proactively build plans and structures, and resolve conflict head on. These types of leaders produce stronger results faster and build team confidence with their ability to manage through complex times. Their businesses tend to experience less turnover in key staff. The concept is logical: Everyone wants to work with A-players.

Two cases studies depict how two winery industry leaders, facing different types of transitions, managed through conflict and moved on successfully to build stronger businesses.

CASE STUDY #1 — Formalization

Safe open dialogue leads to accelerated growth in cash flow — One Northern California winery experienced rapid and uncontrolled growth that produced conflict among several business partners. The business part-

WINE BUSINESS

ners were coached to communicate through a strategic planning process that allowed them to reach mutual agreement on business goals, resolving their conflict.

According to Deborah Steinthal (Scion Advisors founder), "Our approach to conflict management

helped these business partners break through because we made it safe for open dialogue by discussing topics leading to mutual gain." This client developed a code of conduct that allowed them to communicate, build trust, and move forward together.

Stages of Family Businesses — What stage are you in?

You must be at least one step ahead of your competitors to be profitable in the wine business today. This requires knowing how the wine industry is evolving, understanding your market opportunities, and being clear about your business and brand strategy.

Companies that successfully stay ahead of their competition are also very conscious of what stage they are in. This level of consciousness enables a business leader to know what to focus on and what is coming up ahead.

Startup mode — Your singular challenge is to turn your dream into reality and survive long enough to establish successful cash flow. Often this is about juggling many new and different balls and learning how to make and execute critical decisions on the fly.

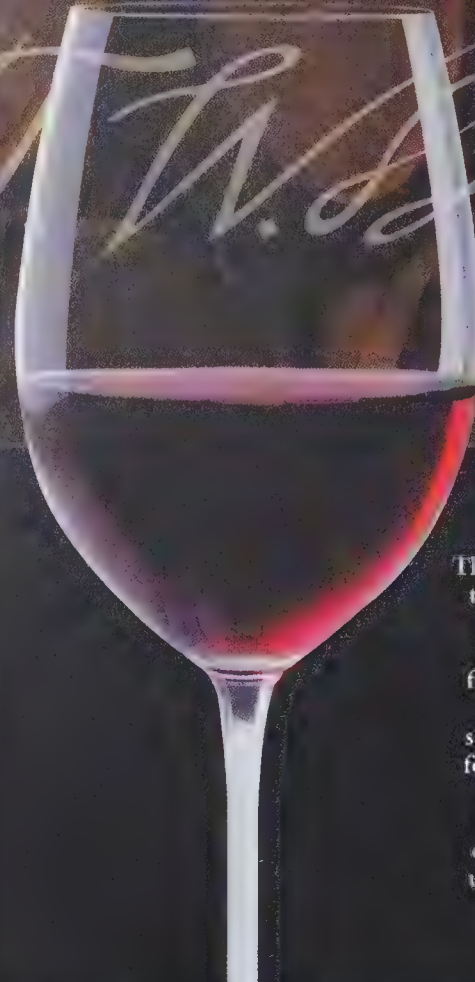
Formalization stage — Your success is dependent on having a viable, competitive business strategy. At this stage, winery leadership must manage increasing complexities of the business, understand and leverage financing techniques, and develop professional management skills. In this stage, effective organizational systems and procedures are essential to survival and growth.

Maturity — Your key challenges are to renew and refocus strategy, reinvesting where necessary to keep building equity, momentum, and vitality as a brand and a business. This is a time to reexamine your financial business model and its profit potential, in order to revamp your organization and ensure future growth.

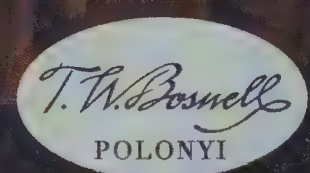
Scion Advisors worked with the winery owners to stabilize decision making by launching a board of directors with outside participants. This new organization structure, with stronger leadership in place, supported the winery's turn-

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Understanding the dynamics of transition

An important author and business thinker, William Bridges [www.wmbridges.com] describes three types of transitions: 1) endings; 2) "neutral zone" (periods of confusion and turmoil); and 3) new beginnings. The key is recognizing which type you are facing, so you can meet your transition head on and proactively.

1. **Endings**, both successful and less successful, are accompanied by shock, anger, denial, grief, and a feeling of loss. These emotions show up with the passing of the business to the next generation, bankruptcy, being bought out, or perhaps a merger/partnership with other wineries. Leaders who are able to successfully navigate these challenges think ahead, prepare for changes in their business, and seek advice.

2. **In the neutral zone**, a business leader often experiences extreme confusion and disorientation. This particular transition can be an incredibly creative time if the business leader can stay balanced and focused on the future.

3. **New beginnings** arrive with renewed energy, a new direction, and the creation of new roles and responsibilities. Generally, work productivity is high and if focused successfully, this dynamic can drive higher returns around the family business. The analogy of tuning a blow torch comes to mind.

the courage and motivation to commit the time and resources to rebuilding a business and its key relationships. Outside objective criteria allows business leaders to move beyond their separate positions and drive decisions that are good for the business.

CASE STUDY #2 — Maturity Executive coaching enables young leader to grow profits.

Another North Coast winery client became a next generation owner — a major role transition that cast his dad to the sidelines. This winery leader was



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around. The result was a 200% growth in cash flow within three years.

Coaching trade secrets

All involved partners were interviewed individually. This uncovered that each had different issues and yet, similar business goals and needs. An assessment from an outside perspective is valuable in helping business partners realign goals and vision. This simple step sometimes is enough to give a team of business leaders

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coached while he developed what he calls "gray hair" around the business. Our assessment of his business and market opportunity gave him insights that allowed him to craft a new strategy for his winery and build a new, skilled team to execute that strategy. He realized that a majority of his old management team no longer fit his needs for the future.

Scion Advisors collaborated with this client to strengthen his leadership approach and revise the business plan. Scion Advisors helped him build a strategic plan, and then hire and develop a new team. To take the emotions out of key decisions, he expanded his problem-solving skills by using objective data from Scion assessments. He empowered his new team to move forward with cascading goals and more accountability for results.

The health of his business was accelerated through coaching on how to exe-

cute through people, rather than doing the work himself. The result was a 70% growth in profits in four years.

Coaching trade secrets

In the face of the unknown, every successful leader experiences self-doubt and feelings of vulnerability, especially when brokering tough decisions involving people who have been loyal to your family business.

Building a trusting relationship with your business coach is paramount to increasing your ability to break through hurdles. Once you share things never before revealed, you actually achieve a new level of introspection and awareness about your options. This trusting relationship can enable you to try new things with more confidence, such as learning how to realign a team more successfully.

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What next?

There is a cost to conflict that shows up in your business results. Tense relationships have a negative impact on employee motivation and commitment, hinder performance, and limit your ability to meet financial goals. Sometimes, an outside, objective, informed perspective can shed new light on a complex issue, reframe pos-

sible solutions, provide new tools, and speed up conflict resolution.

Through working with business coaches and advisors, successful wine business leaders are learning new critical thinking skills and tools that help them confront conflict and vault ahead of competitors in a convoluted wine marketplace. ■

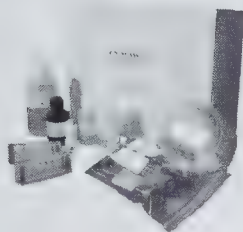
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Zinfandel Heritage block at UC Oakville Station research vineyard.

PART II

Clonal diversity of Zinfandel

BY Nancy L. Sweet,
Foundation Plant Services, UC Davis,
Dr. James A. Wolpert,
Dept. of Viticulture & Enology,
UC Davis.

Publicly-available FPS Primitivo and Zinfandel selections underwent a series of comparisons by several research groups in California between 1990 and 2003. The studies were conducted at three different sites, using varied experimental protocols for vine management.

The results demonstrated that, although both varieties share the same DNA structure, there can be meaningful differences between Primitivo and Zinfandel selections in terms of performance in the field and wine style produced.

Four publicly-available FPS Zinfandel selections (Zinfandel FPS 01A, 02, 03, and 06) and Primitivo FPS 03 were compared in a vineyard near Arbuckle, in the Sacramento Valley. The vines were

planted in 1988, and data was taken 1990–1994. The vines, on Harmony rootstock, were trained to a T-trellis with a bilateral cordon on the lower wire. Vines were drip irrigated and spur pruned.¹²

The researchers found few differences in growth and yield parameters among Zinfandel clones at Arbuckle.

Zinfandel FPS 06 (the heat treated selection from Zinfandel FPS 01A) was included in the trial to test whether heat treatment would have any viticultural significance. Zinfandel FPS 06 did show some differences from Zinfandel FPS 01A in pruning (+ 0.2 kg) and berry (+ 0.15 g) weights. However, no Zinfandel selections demonstrated the looser clusters and smaller berries exhibited by Primitivo FPS 03.

Zinfandel selections FPS 01A, 02, 03, 06, and Primitivo FPS 03 were included in a trial 1991–1997 in the San Joaquin Valley near Lodi, CA. The vines were grown for White Zinfandel production in 1991–1993

and the remaining years for red Zinfandel. The vines, on Freedom rootstock, were trained to a bilateral cordon and spur-pruned.

A low volume drip system provided irrigation. Production data was very similar over the years of the experiment in terms of trends and significant differences; the 1994 data was used to report the findings.¹⁰

In the Lodi trial, there was little or no significant difference among the Zinfandel clones in terms of performance in the field. The primary finding in this trial was a significant difference between Primitivo FPS 03 and the FPS Zinfandel clones. The Zinfandel group had higher yields and fewer clusters per vine, more clusters and higher berry weights, and later maturity dates than Primitivo FPS 03. In 1994, the red Zinfandel group had lower soluble solids (°Brix) and later maturity dates than Primitivo FPS 03.

The most recent evaluation of the performance of FPS Zinfandel and Primitivo registered selections is an ongoing research study of grapevines planted in 1997 in a vineyard at the UC Kearney Agricultural Center in the southern San Joaquin Valley. The vines were grown on their own roots, common in Fresno County. They were trained to a bilateral cordon on a single wire trellis. Vines were irrigated by furrow and spur-pruned. Data was taken in 2000, 2001, 2002, and 2003.⁴

There were few differences observed among Zinfandel selections tested in the Kearney trial. However, in the southern San Joaquin Valley (unlike in Arbuckle and Lodi), the Zinfandel selections yielded similar or lower weights (kg per vine) than the Primitivo selections.

Zinfandel selections had fewer clusters per vine, a slightly higher berry weight overall, and lower soluble solids at harvest than Primitivo selections. It was posited that the differing yield findings of Primitivo and Zinfandel in Arbuckle/Lodi versus Kearney could be from a rootstock-scion interaction and/or regional data for making recommendations on

planting (such as rootstock compared to own roots).

Paul Verdegaaal (San Joaquin County farm advisor), stated: "My take on the feasibility of comparing Zinfandel clones across districts [appellations] is you will see differences (terroir) but, in many cases, they will be very subtle and affected by management, especially irrigation. The one 'clone' that always seems to stand alone is Primitivo compared to any Zinfandel."⁹

Primitivo FPS 03 was the only registered FPS Primitivo selection included in all three clonal evaluations. In Arbuckle and Lodi, where vines were grown on rootstock, Primitivo FPS 03 simultaneously produced more clusters per vine and a lower yield than the Zinfandels, explained by Primitivo 03 having fewer and smaller berries. In Kearney, the vines were grown on their own roots.

Primitivo FPS 03 had a 15% higher yield than the remaining selections in

the Kearney trial, despite the fact that (unlike Arbuckle and Lodi) average cluster weight and berries per cluster were similar for all selections. The higher yield for Primitivo 03 was attributed to statistically significant more clusters per vine for that selection compared to others.

More importantly, the Primitivo selections in Kearney suffered substantially less sour rot than did the Zinfandel selections, evidencing a lower susceptibility to bunch rot. "One of the major impediments to producing Zinfandel fruit of acceptable quality in the central San Joaquin Valley is Zinfandel's high susceptibility to sour rot," stated Matthew Fidelibus.⁴

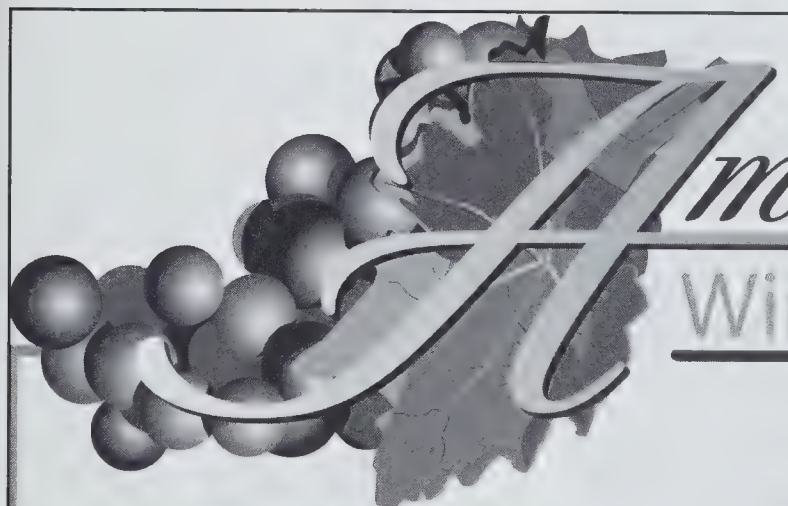
Within the Primitivo selections themselves, Primitivo FPS 03 was second to Primitivo FPS 06 in the percentage of clusters affected by rot (40% versus 34%). The Lodi study also assessed the vines for bunch rot and, when rot was measurable during the trial, the

least amount occurred on Primitivo FPS 03. Researchers in Lodi attributed that finding to Primitivo's looser clusters, smaller berry size, and earlier maturity date.

Soluble solids were measured in all three trials. The Primitivo selection(s) had higher soluble solids at harvest than any Zinfandel selections in Kearney, Lodi, or Arbuckle. That result is not surprising given the early fruit maturation of the Primitivo variety, in general.

For example, Primitivo FPS 03 ripened (on average) seven to ten days ahead of Zinfandels in Lodi. However, Primitivo FPS 03 was noted by Kearney researchers for its combined high yields of fruit (significantly higher than other Primitivo and Zinfandel selections) plus high soluble solids. A significant addition to those positive findings is the relative low incidence of sour rot experienced by Primitivo FPS 03.

Primitivo FPS 05 and 06 were formally evaluated only at Kearney. The



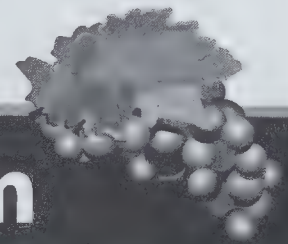
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notable findings for those selections were: Primitivo FPS 05 (along with Primitivo FPS 03) had significantly smaller berries than other selections; Primitivo FPS 06 had the lowest incidence (34%) of clusters affected by sour rot of all selections; the fruit of Primitivo FPS 06 matured quite early and had a higher juice pH; and Primitivo FPS 06 and Primitivo FPS 03 were characterized as best performers in terms of fruit maturity, yield, and bunch rot susceptibility.

The only reported wine tasting trials involving the FPS registered selections were done in conjunction with the Lodi trial. The red wine tasting panels were done in 1994-1997, with wine lots made by Woodbridge Winery. In 1994, the wines were divided by the tasters into two groups. Zinfandel FPS 03, Primitivo FPS 03, and Zinfandel FPS 06 (in order of preference) were in the top group, with more dense color, better hue, and more black cherry and berry flavors.¹⁰

It was considered surprising that two of the heavier yielding clones — Zinfandel FPS 03 and 06 — were in the top group. Paul Verdegaal stated that, in 1995, the same plots were not thinned enough but there were differences in the wines. The tasters preferred Zinfandel FPS 03, 06, and 02 to an overcropped Primitivo FPS 03 and Zinfandel FPS 01A. Verdegaal added that, in 1996, the plots were thinned and preferences split into three groups: 1) Primitivo FPS 03; 2) Zinfandel FPS 03, 06, and 02; and 3) Zinfandel FPS 01A.

The evidence from the three Central Valley trials showed that the Primitivo and Zinfandel "clones" performed in a substantially different fashion in Arbuckle, Lodi, and Kearney. In all sites, Primitivo fruit matured earlier than Zinfandel grapes. Not surprisingly, the name of the Primitivo variety comes from the Latin *primus*, which means "first."

The Primitivo grape variety is "early at all stages of its physiological development compared to other vine varieties."³ One significant finding differentiating the two sources of "clones" (Zinfandel and Primitivo) in all three locations is that Primitivo clusters continue to be structured differently (looser, less compact) than those of Zinfandel.

Zinfandel evaluation in Oakville

A study to compare 63 Zinfandel clones and field selections was initiated in 1995 on vines grown in the Zinfandel Heritage Vineyard located at the University of California's Oakville Experimental Vineyard in Napa County, CA. Phase I of the study included Zinfandel selections FPS 01A, 02, 03, and Primitivo FPS 03, 05, 06. The remaining vines consisted of Zinfandel Heritage clones from various counties throughout California. Traditional management techniques were used to

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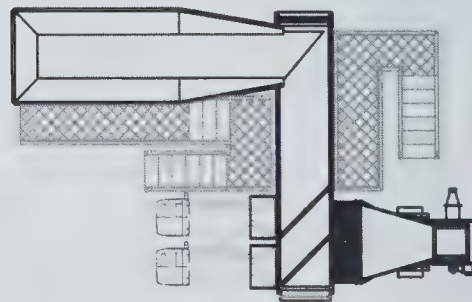
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maintain the vines, which were budded in 1995-96 (Phase I) onto St. George rootstock.

The vines were head-trained (supported by split redwood stakes) and spur-pruned. A subsurface drip irrigation system was employed.¹ The project had not yet reached the replicated trial stage but certain preliminary observations were made from data collected in 1998; Primitivo matured (°Brix) sooner than Zinfandel and had lighter mean berry weights and cluster weights than Zinfandel. Primitivo clusters continue to be structured differently (looser, less compact) even when grown in a climate and topography such as Napa County. The vines for the study were removed and the project terminated in 2006.

FPS proprietary selections

Zinfandel FPS 08 is a proprietary selection brought to FPS in 1996 by Bob Dempel (Dempel Farming Co., Santa Rosa, CA). The source of the plant material was 100-year-old Zinfandel vines planted on Bisordi Lane in Fulton, Sonoma County. Some of the original material submitted to FPS tested negative for virus and qualified to be planted into the Foundation block, where it was identified as Zinfandel FPS 08. This selection first appeared on the FPS Registered list in 1998. Zinfandel FPS 08 was removed from the Foundation block in 2006; however, mother vines in private increase blocks remain registered sources of California Certified Stock.

Dempel states that Zinfandel FPS 08 is known for small clusters and berry size. Wine produced from Zinfandel FPS 08 berries by Paradise Ridge Winery (Santa Rosa) in 2003 exhibited deep color, a rich texture and brambly berry, spice and pepper flavors.¹¹ Dempel sells California certified Zinfandel FPS 08 vines propagated from his registered increase block at Dempel Ranch Vineyards in Hopland, CA. Zinfandel FPS 08 is also available from Dempel's licensee, Sunridge Nurseries.

Zinfandel FPS 29 is a sub-clone of Zinfandel FPS 08 propagated by shoot tip tissue culture techniques from

Zinfandel FPS 08. Zinfandel FPS 29 is a proprietary selection owned by Dempel, who named it the Baldocchi Zinfandel clone in honor of his friend Dewey Baldocchi, a winemaker and pioneer in the Sonoma County grape industry.⁶ Zinfandel FPS 29 plant material has tested negative for virus and is expected to be added to the FPS Registered list.

Zinfandel FPS 13 is a proprietary FPS selection owned by NovaVine Grapevine Nursery (Santa Rosa, CA). The original plant material came to FPS in 1999 from an old vine Zinfandel vineyard owned by Milton and Ellen Heath. NovaVine Zinfandel clone vines are grown in sandy loam soil on the Kelseyville benches (1300-2000 feet) at the base of Mount Konocti in Lake County.

Jim Smith, manager of the source vineyard observed, "The vines [of this clone] yield a versatile grape that is very 'fruit forward' with a nose that

'jumps out of the glass.' Spiciness can be dictated by an open canopy (very fruity) or an extra-shaded canopy (heavy peppery characteristics)." Five wineries — Wild Hog, X Winery, DeLoach, Hallcrest, and Jelly Jar — have produced unique and very different wines composed almost solely of this clone's fruit.⁷

All tests on Zinfandel FPS 13 at FPS were negative for viruses, and it was placed on the Registered selection list in 2006. Plant material for Zinfandel FPS 13 can be obtained through NovaVine Grapevine Nursery, Inc.

Zinfandel FPS 16 is an old-vine Zinfandel proprietary selection owned by Kendall-Jackson for its Hartford Court label. The original plant material came to FPS in 1997 from a vineyard located on Wood Road in Forestville, Sonoma County, approximately 15 miles from the Pacific Coast. The vineyard was originally planted in the early 1900s, and

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the vines are head-trained on St. George rootstock.

Don Hartford, owner of the Wood Road vineyard, noted: "This clone seems to do well in the cool Russian River Valley climate. It gets fully ripe while maintaining a great acid balance that promotes a bright fruit character along with good weight and texture."⁵

Kendall-Jackson maintains another planting of this same Hartford clone on shallow gravelly (Huichica) clay loam soil atop a hill overlooking the Santa Rosa plain in Windsor, Sonoma County. Under cool, sometimes humid conditions, in shallow clay loam soil on a hillside, this Zinfandel clone is reported to ripen in a timely manner and produce concentrated flavors.

Zinfandel FPS 16 plant material was produced by shoot tip tissue culture propagation of the original Wood Lane plant material and became a Reg-

istered selection in 2006. Plant material may be obtained from Kendall-Jackson Nurseries, Santa Rosa, CA.

Public Heritage Zinfandel clones

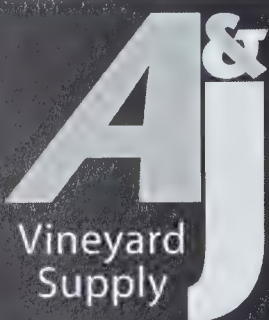
Several heritage ("old vine") clones may become publicly available through FPS in the future after more testing. Old-vine sources for Zinfandel plant material are sought after by winemakers. The theory is that grapes from very old vines maintained in the traditional head-trained style for vine balance produce more concentrated flavors.⁸ The concentrated flavors are believed to be the result of low crop yields under those parameters. In 2002, two groups of heritage Zinfandel grapevines were donated to FPS for the public benefit.

Gary Morisoli donated nine varieties from the Napa Morisoli Heritage Vineyard, which is thought to have been originally planted in the late 1800s. The vineyard was predominately Zinfandel but, as is common in

older California vineyards, there were other varieties present, including both wine and table grapes. Morisoli's grandfather (born 1902) said that, as a teenager, he began to replace some old vines in the vineyard as they died. Morisoli suspects that some of the original plantings remained in the vineyard.²

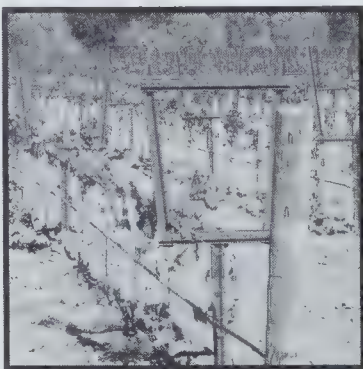
In 2001, ampelographer Jean-Michel Boursiquot, the soon-to-be Director of ENTAV in France, author Jim Wolpert, and FPS Director Deborah Golino visited the vineyard to examine vines. About 1¼ acres of the vineyard remained. Boursiquot was able to identify nine varieties of interest to FPS and the public heritage clone program, and vines were marked with correct variety names. In December 2001, Dr. Golino collected dormant wood from those mature vines for testing and treatment at FPS.

The original plant material donated to FPS tested positive for several



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viruses and must undergo shoot tip tissue culture propagation prior to certification for the Foundation block. It is possible that plant material for this old Zinfandel selection will be available to the public by 2012.

A second source of old vine Zinfandel arrived at FPS at the same time as the Morisoli selection. The source of this second group was the Gate Vineyard (Niebaum-Coppola Estate) in Rutherford, CA. That original plant material tested positive for virus and must undergo shoot tip tissue culture propagation. This source of heritage Zinfandel could be available to the public as early as 2012.

California Heritage Zinfandel project

Zinfandel Advocates and Producers (ZAP) and Dr. Jim Wolpert, Viticulture Extension Specialist at the University of California, Davis (UCD), have agreed to release to the public grape

collection all Zinfandel Heritage Project selections previously brought to Foundation Plant Services (UCD). Twenty heritage clones have attained foundation stock status in the California Grapevine Registration & Certification (R & C) Program. Mist-propagated plants will be available for distribution from FPS to R & C participating nurseries starting April, 2009.

The Zinfandel Heritage Project, initiated in the 1990s to preserve germplasm from historical California Zinfandel clones for the benefit of the public, was directed by Wolpert and funded by ZAP, a trade association of producers and consumers of Zinfandel wine.

The Zinfandel Heritage Project team collected Zinfandel clones from California vineyards planted before 1930. The team wanted the collection to represent as wide a geographic range as possible; when complete, the collection represented fourteen

California counties from San Bernardino to Mendocino. The team specifically sought vines with loose clusters and small berries.

Sixty-three selections were budded onto rootstock at the UC Oakville Station research vineyard (1995–1996). Twenty-two additional selections were added in 1999. The intent of the Phase 1 research in the Zinfandel Heritage Project was to do initial screening of the clones and preserve the clonal material. Although this stage of the research did not involve replicated trials, data describing juice chemistry, vegetative, and reproductive growth were collected from each selection for six years.

FPS donated disease testing and elimination treatment services to the Zinfandel Heritage Project. Budwood from 20 of the Zinfandel Heritage Project vines was sent to FPS at the beginning of the project under code names to start the registration and certi-

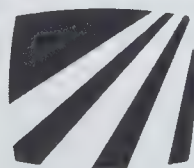


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fication process. The selections arrived in three groups — 1991, 1997, and 2001 — and were screened for virus.

Ten heritage selections were not required to undergo virus elimination therapy. The remaining ten selections underwent shoot tip tissue culture treatment after virus testing. It is expected that all 20 heritage Zinfandel selections will attain registered or provisional status

when the FPS list of Registered Grape Selections for the 2008–2009 Dormant Season was released in early 2009.

ZAP and Wolpert advanced 18 heritage selections and four standard UC selections (Zinfandel FPS 02, and 03, and Primitivo FPS 03, and 06) to Phase II trials in the Zinfandel Heritage Project. Phase II research was set up as a replicated trial, to obtain more meaningful

data. FPS received the majority of its Heritage Zinfandel selections early in the project, so few of the selections are in the Phase II trial at Oakville.

In Phase II, the decision was made to increase the plot size and vine number per selection to make larger, more representative wine lots. The 2.4 acre Phase II site was planted with five replicates of 18 vines per selection, for a total of 90 vines

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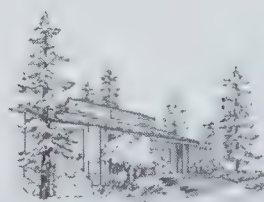
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per selection (spaced six feet between vines and eight feet between vine rows). Three years of research wine (2006, 2007, 2008) was made by Ravenswood Winery and evaluated. Performance data was also accumulated in this phase.

Planning for Phase III of the Zinfandel Heritage Project is currently in progress. Cuttings have been taken from the FPS Foundation Vineyard for a future ZAP clonal research study to be administered by Wolpert. This phase of the project will yield data relative to the selections featured at FPS. Phase III research will evaluate how site conditions affect the performance of each heritage selection.

ZAP and Wolpert are in the process of identifying "grower-cooperators" to establish Zinfandel Heritage selections in diverse locations throughout California. They are looking for ideal research sites with uniform soil and adequate size.

Zinfandel Heritage Project selections at FPS will be available to the

public five years after they are released to Wolpert and ZAP.

The original source of each Zinfandel Heritage Project selection will remain confidential for the present time. ZAP and Wolpert do not want undue influence placed on association with a place name or winery over actual performance and wine research results. They encourage selection of clones based on performance in replicated trials.

For more information on the Zinfandel variety, see <http://iv.ucdavis.edu> or the 2007 FPS Grape Program Newsletter ("The Zinfandels of FPS") at <http://fps.ucdavis.edu/WebSitePDFs/Newsletters&Publications/GrapeNewsletterNov2007.pdf>. ■

Acknowledgments

In addition to the helpful contributions of the individuals expressly mentioned in the article, we would like to give thanks to the following for providing assistance: Michael Anderson, Susan Nelson-Kluk, Jarue

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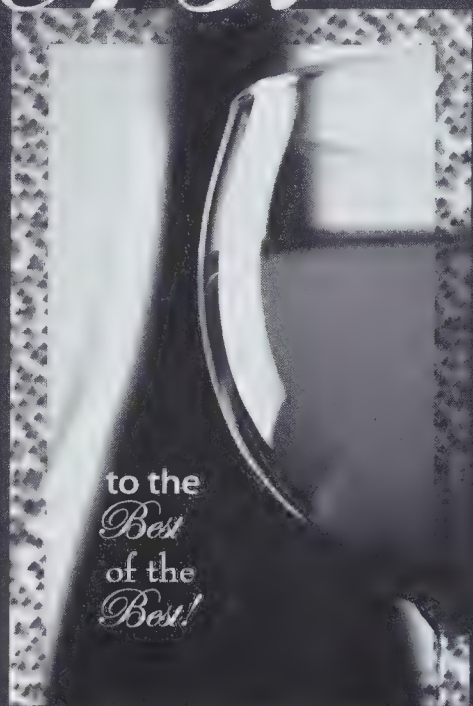
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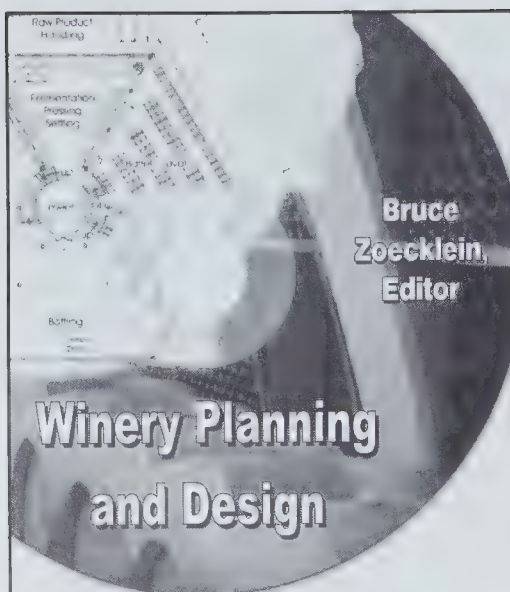


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Manning and Janet Caprile. This text was edited from original publication in the FPS Grape Program Newsletter, November 2007.

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ENERGY EFFICIENCY SERIES #1

Winery Lighting Upgrades

BY Tina Viera

Wineries and vineyards are looking for energy-saving measures to implement, both to reduce operating costs and carbon footprint. As mentioned in previous reports in *PWV*, the best course of action is an energy audit (see *Benefits of energy auditing for your winery*, May/June 2005), followed by upgrades with small capital outlay. Using the money saved by each improvement, you can move up to projects requiring more capital outlay. The final step once lower energy use is achieved is to install renewable energy to power your operations.

Pacific Gas and Electric Company (PG&E) in California offers wineries and vineyards design assistance and financial incentives (up to \$3.6 million per project) to support energy-efficient, high performance facilities. Whether building a new winery, or retrofitting old inefficient equipment, the utility, with funding from the state Public Utilities Commission (CPUC) can assist your efficiency upgrade.

Lighting and controls

"We have found that lighting projects are fairly simple to implement, with low capital outlay, offering a swift pay back," reports Josaphine Tuchel of PG&E's Ag and Food Processing program. "Wineries often undertake lighting projects as a first step toward energy efficiency, realize reduced energy costs immediately, and obtain financial and marketing leverage for future energy efficiency projects."

Using high-efficiency fixtures and lighting controls, and taking advantage of natural daylighting, can substantially minimize energy use while enhancing the functionality of interior space. In every case, replacement fixtures should not exceed the

Low wattage, high-bay florescent lighting replaced metal halide fixtures in the red fermentor room at Geyser Peak Winery (Geyserville, CA), for a 65% energy savings while maintaining existing light levels.

SUSTAINABLE BUSINESS

Table I: Schedule of lighting rebates for bulb or fixture replacement*

Product code	Fixture description	Rebate/unit
INTERIOR FLUORESCENT FIXTURES		
L895	>400 watt lamp basecase, up to 600 watt replacement fixture	\$125/fixture
L292	400 watt lamp basecase, up to 244 watt replacement fixture (tier 1)	\$100/fixture
L896	400 watt lamp basecase, 245 to 360 watt replacement fixture (tier 2)	\$75/fixture
L956	176-399 watt lamp basecase, up to 192 watt replacement fixture	\$75/fixture
L955	101-175 watt lamp basecase, up to 128 watt replacement fixture	\$50/fixture
L954	≤100 watt lamp basecase, up to 64 watt replacement fixture	\$35/fixture
COMPACT FLUORESCENT FIXTURES		
L965	interior 400 watt lamp basecase, up to 390 watt replacement fixture	\$45/fixture
L964	interior 176-399 watt lamp basecase, up to 275 watt replacement fixture	\$20/fixture
L963	interior 101-175 watt lamp basecase, up to 160 watt replacement fixture	\$20/fixture
L962	interior ≤100 watt lamp basecase, up to 70 watt replacement fixture	\$17/fixture
LA00	exterior ≤100 watt lamp basecase, up to 70 watt replacement fixture	\$17/fixture
INTERIOR PULSE-START METAL HALIDE FIXTURES		
L969	>400 watt lamp basecase, up to 820 watt replacement fixture (tier 1)	\$100/fixture
L971	>400 watt lamp basecase, up to 821-950 watt replacement fixture (tier 2)	\$50/fixture
L968	400 watt lamp basecase, up to 400 watt replacement fixture	\$45/fixture
L967	176-399 watt lamp basecase, up to 275 watt replacement fixture	\$40/fixture
L966	175 watt lamp basecase, up to 190 watt replacement fixture	\$10/fixture
EXTERIOR PULSE-START METAL HALIDE FIXTURES		
L975	>400 watt lamp basecase, up to 820 watt replacement fixture (tier 1)	\$100/fixture
L976	>400 watt lamp basecase, 821 up to 950 watt replacement fixture (tier 2)	\$50/fixture
L974	400 watt lamp basecase, up to 400 watt replacement fixture	\$45/fixture
L973	176-399 watt lamp basecase, up to 275 watt replacement fixture	\$40/fixture
L972	175 watt lamp basecase, up to 190 watt replacement fixture	\$10/fixture
INTERIOR INDUCTION FIXTURES		
L961	400 watt lamp basecase, up to 360 watt replacement fixture	\$100/fixture
L959	176-399 watt lamp basecase, up to 180 watt replacement fixture	\$75/fixture
L958	101-175 watt lamp basecase, up to 160 watt replacement fixture	\$35/fixture
L957	100 watt lamp basecase, up to 95 watt replacement fixture	\$35/fixture

wattage of the original fixtures, and wattage cannot exceed maximums listed in the rebate guidelines [see Table I for details]. Any lighting exceeding 400 watts must be installed at a height of more than 12 feet above the floor.

INTERIOR LINEAR FLUORESCENT FIXTURES AND LAMPS

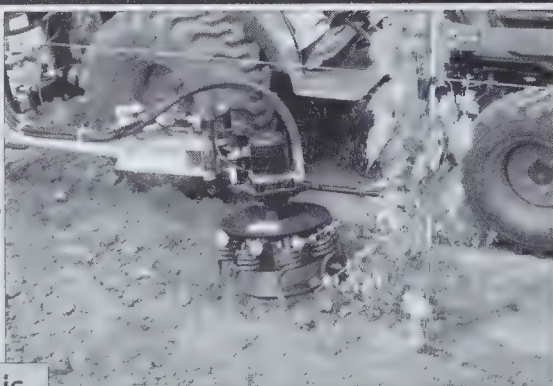
Rebates range from \$35 to \$125 per fixture depending on wattage. Complete fixture and bulb refitting to T8-, T5-, or high-output T5-fixtures are recommended for fluorescent lighting (replacing older, less efficient incandescent, mercury vapor, T12 fluorescent, standard metal halide, and high-pressure sodium), and only specified fixture types qualify for rebates.

If you elect to change out lamps only, rather than fixtures, T5 and T8 lamps replacing T12 lamps earn a per/lamp rebate if they have electronic, high-frequency ballasts with five-year or longer warranties, a power factor of ≥ 0.90, and total harmonic distortion of less than 20%.

Installing T5 lamps under low ceilings can cause excess glare, so check with a lighting professional under these conditions. When

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Annual conference and wine tourism symposium includes: Branding Regional Wines — J. Trezise (NY); Seneca Wine Trail — L. Stamp (Lakewood Vineyards, NY); Wine tourism: key to success in Washington state — R. Pollard; Vintage North Carolina wine tourism — G. Holder; Vintage Ohio, How do we do it? D. Winchell; Iowa Mystery Shoppers, DMACC Special Report — B. Johnson; New York Wine & Culinary Center: How we did it and how it helps promote New York Wines — J. Trezise; Developing different marketing approaches to different age groups — D. Winchell; Production technology and challenges with aromatic white varieties — C. Stamp (NY); Winemaking for beginners — P. Gospodarczyk (DMACC); Quality grape production on a commercial scale, how to market grapes/winery relations — D. Nitz, Arrowhead Vineyards, (MI); Introduction to grape production for beginners — R. Vos (DMACC); Experience with a mobile wine lab — G. Holder; Analyzing different nutrition programs and rootstocks and the influence these factors have on vine growth — T. Bates, Cornell University (NY); Yeast selection / fermentation management — C. Cone (Lallemand, Inc.); ISU wine cultivars: what works in Iowa? — P. Domoto; Vineyard floor management — T. Bates; Managing tasting rooms — L. Stamp; How to produce grapes that wineries want: Key practices that lead to high quality fruit that has potential to make quality wine — C. Hosmer, Hosmer Winery (NY); Making specialty wines + wine tasting: Ice wine (by freezing grapes) and port — C. Stamp.

More information and registration available at www.iowawinegrowers.org.

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Table I continued

T5 OR T8 FLUORESCENT LAMPS REQUIREMENTS FOR DIFFERENT BALLASTS

Lamp type & size	For ballast type	CRI must be	Minimum rated
T8 – 2-ft, 3-ft, 4-ft	programmed start or programmed rapid-start	80	24,000 hours
T8 – All sizes	instant start	80	18,000 hours
T5 – All sizes	programmed start or programmed rapid-start	82	20,000 hours

Product code	Fixture description	Rebate/unit
LAMPS INSTALLED		
L170	2-ft lamp/installed	\$3.50/lamp
L18	3-ft lamp/installed	\$4.25/lamp
L19	4-ft lamp/installed	\$4.25/lamp
L20	8-ft lamp/installed	\$7.50/lamp
LAMPS DELAMPED		
L17	2-ft lamp/removed	\$4/lamp
L18	3-ft lamp/removed	\$4/lamp
L19	4-ft lamp/removed	\$6/lamp
L20	8-ft lamp/removed	\$9/lamp
COLD CATHODE LAMPS		
L734	cold cathode lamps	\$2/lamp
INTEGRATED BALLAST CERAMIC METAL HALIDE PAR LAMPS		
L984	integrated ballast cmh par lamps	\$12.50/lamp
CERAMIC METAL HALIDE FIXTURES		
L982	ceramic metal halide directional lighting fixtures	\$45/fixture
SCREW-IN, COMPACT FLUORESCENT LAMPS		
L985	screw-in compact fluorescent, 14–28 watts, reflector lamps	\$5/lamp
HIGH-EFFICIENCY EXIT SIGNS		
LA01	exit sign, incandescent basecase	\$27/fixture
LA02	exit sign, cfl basecase	\$15/fixture
CHANNEL SIGNS (LED)		
L282	indoor ≤2 ft. retrofit	\$4/foot
L286	indoor ≤2 ft. replacement	\$4/foot
L284	outdoor ≤2 ft. retrofit	\$2/foot
L288	outdoor ≤2 ft. replacement	\$2/foot
L283	indoor >2 ft. retrofit	\$6/foot
L287	indoor >2 ft. replacement	\$6/foot
L285	outdoor >2 ft. retrofit	\$3/foot
L289	outdoor >2 ft. replacement	\$3/foot
OCCUPANCY SENSORS		
L82	wall-box	\$16.50/sensor
L859	wall- or ceiling-mounted <500 watts	\$20/sensor
L860	wall- or ceiling-mounted 500 watts	\$44/sensor
L861	fixture-integrated in installations over 12'	\$20/sensor
L978	fixture-integrated in installations 12' or under	\$7/sensor
PHOTO CELLS		
L36	photocells	\$7/photocell
TIME CLOCKS		
L31	time clocks	\$36/time clock
PLUG LOAD OCCUPANCY SENSORS		
L65	plug load occupancy sensor	\$15/sensor

*Table reflects January 2009 rates, which are subject to change.
Please check pge.com/biz/rebates for current rebates.



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installing T8 lamps but no occupancy sensors, use instant-start ballasts. If you install occupancy sensors, use programmed-start or programmed rapid-start ballasts for longer lamp life.

There is even a de-lamping (removing some of your bulbs) rebate, for permanent removal of T12 lamps, ballasts, and unused lampholders from existing fixtures. This rebate can be combined with a rebate for replacing lamps, as long as you do not claim more de-lamping credits than the number of replacement T5 or T8 lamps/ballasts. Wineries must evaluate remaining light levels for safety and adequate work lighting once de-lamping or replacing lamps is completed.

COMPACT FLUORESCENT (CFL) FIXTURES

To qualify for the utility rebate, the complete fixture must be changed to a hard-wired fixture for pin-based (not

screw-in) CFL lamps. New ballasts must be electronic, with a power factor of ≥ 0.90 , and total harmonic distortion of less than 20%.

INTERIOR AND EXTERIOR PULSE-START

METAL HALIDE FIXTURES

Wineries can use complete new fixtures, or retrofit kits for pulse-start metal halide fixturing. Replacements must be equipped with pulse-start metal halide lamps, and either magnetic or electronic ballasts.

BI-LEVEL STAIRWELL/HALL/GARAGE FIXTURES

Eligible units are hardwired fluorescent fixtures with electronic ballasts, pin-based lamps, and manufacturer-integrated occupancy sensors. If the area is occupied, the fixture should be set to operate at full output, and during unoccupied periods the fixture should operate at reduced light output and wattage.

Interior induction fixtures are also included for rebates, under terms described above.

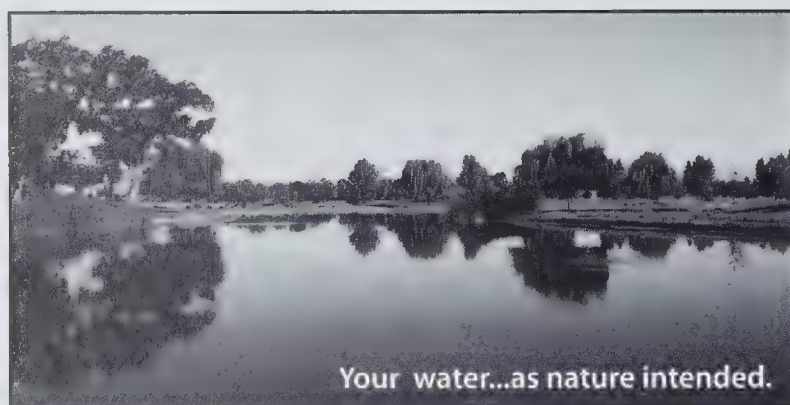
ACCENT/DIRECTIONAL LIGHTING

Wineries can replace existing reflector-type, directional lamps or fixtures (incandescent, PAR halogen, or PAR halogen IR) for rebates. Qualifying replacement fixtures are ceramic metal halide, with wattage of 39 watts or lower. Be sure the fixtures are compatible with existing lighting controls.

Qualifying replacement lamps include integrated ballast ceramic metal halide PAR lamps (25-watt, 10,500 hours of rated lamp life), and screw-in CFL 14-28 watt reflector lamps with the Energy Star label.

SIGNAGE

Exit signs qualify for lighting rebates, if they are new, LED (light emitting diode), electroluminescent,



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or photoluminescent, replacing incandescent or CFL-lit signs. The new exit signs must have usage levels less than 5 watts and minimum product life of 10 years (or be Energy Star qualified), and meet local fire codes.

Channel letter signs can also be changed for more efficient models using either LED retrofit kits, or com-

plete LED replacement signs. The new sign qualifies for a rebate if it uses 20% or less input power compared to the sign replaced.

CONTROLS

Occupancy sensors are an easy way to drop energy use by automatically turning lighting on or off, based on room occupancy. Rebates are available

for hardwired, passive infrared, or ultrasonic detectors to control interior lighting, and for photoelectric cells that switch outdoor lighting on at dusk and off at dawn.

Time clocks controlling lighting equipment are also eligible for rebate. Units should feature a 3-hour battery back-up in case of power outages, and outdoor units without a photocell

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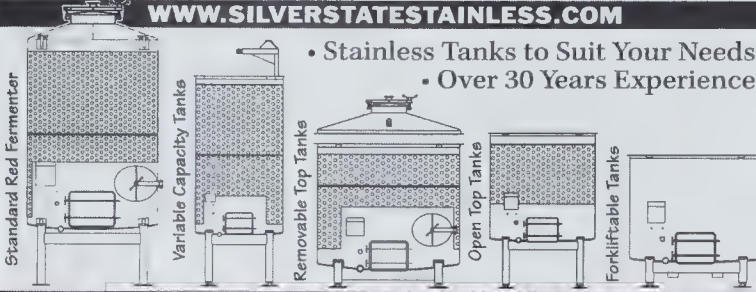
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should feature astronomical time clocks (where on-off time follows sunset and sunrise).

Plug-load occupancy sensors control office equipment using electricity, including shared copiers and printers. Rebates apply when passive infrared and/or ultrasonic plug-load occupancy sensors are installed.

Shenandoah Vineyards (Plymouth, CA)

The Sobon family are longtime advocates and practitioners of sustainable winegrowing, and in the past several years, have set about reducing their carbon footprint. When they hired Renewable Technologies (RTI, Sutter Creek, CA) to install a solar photovoltaic (PV) system for them, RTI first performed an energy audit, and then recommended affordable efficiency upgrades before they installed the PV system.

Shenandoah consolidated all of its electric meters into a single unit. Electric utility rates are charged, in part, on how electrical energy is used, and by consolidating meters, the winery was able to select a single utility rate schedule and reduce overall billing.

The winery replaced two old, unrated heat pumps in the tasting/gallery/office areas, with a heating, ventilation and air-conditioning (HVAC) system with a SEER-13 rating. Darryl Conklin (RTI) explains, "We estimated that the units removed were over 30 years old. Had they been installed even 10 years ago, they would most likely have had a SEER rating of 8 (less efficient), and we would guess that units installed prior to 1980 would have a rating of just 6. Heat pumps with a SEER 13 rating like the new ones at Shenandoah, provide a 55% energy savings compared to pumps with the SEER 8 rating."

Occupancy sensors were installed for the lighting in the barrel rooms, and also digital thermostat timers, which run coolers only during off-peak (lower rate) electric utility hours.

A feasibility study to determine if lighting in all buildings could be replaced by LED fixtures was performed by RTI. When the expense outweighed potential savings, Shenandoah installed sensor units and T-5 fixtures instead. In the case-goods and storage warehouse, 19 T-12 lighting fixtures were removed and replaced with 15 T-5 high-output fixtures.

"We changed all spotlights in our art gallery to CFL floods," says owner Lee Sobon. The winery had insulated its tanks prior to this energy efficiency upgrade.

With upgrades completed, Shenandoah installed a 64-kW DC PV system (50-kW AC) in 2007, which provides

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nearly 100% of the winery's power needs on an annual basis.

"Our carbon footprint has diminished to the point that we are more than carbon neutral," Sobon reports. "This means we are eliminating more CO₂ from the environment than we use."

Geyser Peak Winery (Geyserville, CA)

Aaron Niderost (Director of Operations) and the Geyser Peak team hired Energy Industries (San Jose, CA) as the project manager to replace the lighting at the 400,000-case facility. Retrofits were completed December 31, 2008.

Geyser Peak replaced metal halide fixtures and lamps with high-bay fluorescent lighting fixtures and 772 new lamps (T5 high-output and T8) in the crush/press pad, cellars, barrel storage, warehouses, bottling room, mechanical areas and maintenance



New lighting in Shenandoah Vineyards barrel and tankroom (Plymouth, CA).

rooms. The project cost was estimated at \$200,000, and with PG&E rebates of

\$65,000, net cost to the winery was \$133,000.

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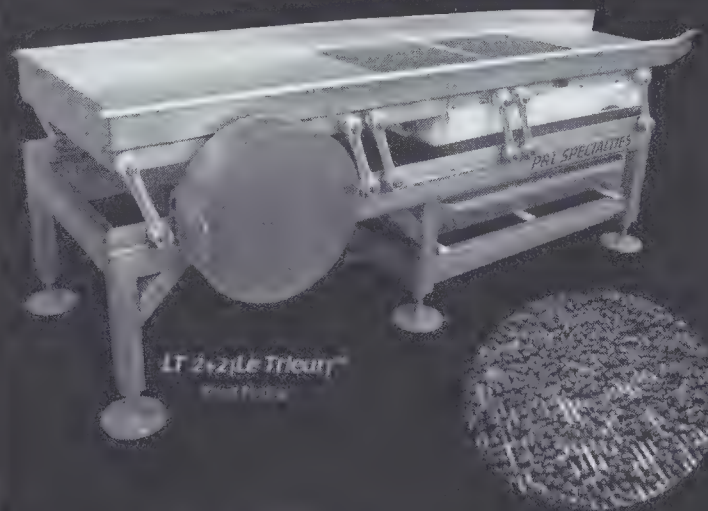
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"The new lighting is all on motion sensors," Niderost reports. "As you walk through a barrel or tank room, there's a faint tink-tink-tink sound as the areas around you light up while you move toward them. It's a really cool effect, and more importantly, an important aspect of energy savings in the new system. The quality and intensity of the new lights is good, and the placement and pattern of lighting were carefully installed to better illuminate work areas where they are most needed."

"We've measured the new lighting system energy use at just 68% of what the old lighting consumed," says Eric Leber, Energy Industries Regional Manager. "System demand, or power demanded from the utility grid, was cut to 52%, just 102.9 kW annually, compared to 215.64 kW of demand by the old lighting system. We estimate that Geyser Peak will realize \$103,795 in cost savings in the first year under new lighting."

Geyser Peak's lighting upgrade is part of a long-term energy efficiency and sustainability planning. The program gained momentum in late 2007 when the winery invited PG&E, and engineers from the Industrial Assessment Center at San Francisco State University sponsored by the U. S. Department of Energy, to perform conservation assessments and energy audits. Some outdoor tanks were insulated, and a boiler replaced.

Starting in summer 2008 and continuing into 2009, the winery initiated and is expanding night-air cooling systems for the large distribution center that serves the entire Ascentia Wine Estates portfolio.

The next upgrades that Geyser Peak is currently researching are more tank insulation, refrigeration upgrades, automated waste water pond aeration, reduction of water use, and a gravity-flow system for potable water. As each upgrade frees

up winery funds from energy savings, Geyser Peak can proceed with more projects.

"This winery has been here since 1880," Niderost adds. "We're more strongly committed than ever to being a part of this community for many more years. All of the projects will be the result of long-term thinking, community spirit, and global concern."

[Wineries interested in the San Francisco State University energy audit program can contact the Mechanical Engineering department, Dr. Ahmad Ganji, 415/338-7736, aganji@sfsu.edu. For more information on PG&E's energy management solutions, call the Business Customer Service Center at 800/468-4743, or visit the website for winery/vineyard rebates: <http://www.pge.com/mybusiness/energysavingsrebates/incentivesbyindustry/agriculture/wineries/>.]

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MERLOT IN MADERA COUNTY

Irrigation and canopy management practices impact on grapevine water relations, berry characteristics, productivity, and wine composition

BY Amanda Roberts

What is the effect of applied water amounts at various fractions of estimated vineyard water use on Merlot yield and grape quality in Madera County (in the central San Joaquin Valley)? A five-year study by Dr. Larry Williams has opened the doors for future research with regard to utilizing or designing trellis systems that may increase wine quality and maintain grape productivity in the San Joaquin Valley. The study provides direction and guidelines to growers who wish to experiment with viticultural techniques that should improve wine quality.

Building on prior research

This research was initiated as Williams recognized a need to examine the interaction between canopy management practices and irrigation amount. Numerous studies had been conducted examining either canopy management or irrigation effects on fruit quality and productivity, and although both cultural practices had separately been shown to affect vegetative and reproductive growth of vines, no one had examined the interaction between the two within the same study.

"While studies had been conducted on canopy management practices in relation to fruit composition and wine quality," explains Williams, "the effects of these factors on vine and/or cluster water status had never been characterized. On the contrary, the many irrigation studies had not quantified the effects of soil or vine water status on



the microclimate within the fruit zone."

Williams noted the pioneering work of Dr. Nelson Shaulis and Dr. Richard Smart, which demonstrated that canopy management practices can have a significant effect on fruit quality: specifically, these practices affect the vine's microclimate within the fruit zone. In general, a greater amount of light within the fruit zone will result in higher levels of tannins, total phenols, and anthocyanins (color) in the fruit.

Studies have also demonstrated that deficit-irrigated vines, when compared to fully irrigated vines, will increase the grape berry attributes noted above. The greater water stress of deficit-irrigated vines will reduce shoot growth, which in turn may increase light

within the fruit zone, thus mimicking the effects of canopy management practices.

Conversely, more light within the fruit zone, due to canopy management, will increase cluster temperature, which, in turn, may increase water loss from the berries and then significantly affect water status, mimicking deficit-irrigation practices.

Williams proposed a study that imposed three irrigation levels in conjunction with leaf removal in the fruit zone and quantified the interaction between the two management practices on fruit and wine composition.

Research team members

To implement the research, Williams obtained the cooperation and support of a grower: John Simpson from Simpson Meadow Vineyards (Madera, CA), and winemakers Lee Nesbitt and Darrin Petersen from Chumeia Vineyards (Paso Robles, CA).

Simpson, a long-time grower in the San Joaquin Valley, proved to be a knowledgeable and creative collaborator. His close proximity to Williams' base at the Kearney Agricultural Center made Simpson a perfect fit for the study.

Simpson signed on immediately, though his intentions for the study differed from Williams'. Simpson's experience of growing grapes in the San Joaquin Valley have convinced him of the region's potential to produce high-quality winegrapes, but he claims that low market prices for grapes from this region have forced him (and other growers in the region) to focus more on tonnage than quality.

Williams' study provided a chance to prove what Simpson had been saying: with the right care, vines from the San Joaquin Valley can produce high-quality wine.

Simpson's winemaking partner was Lee Nesbitt, who agrees with what Simpson says about San Joaquin Valley's potential for quality winegrapes. "Simpson felt that high-quality wine could be made in the San Joaquin Valley, but had not yet," he reflects. "I signed on with Simpson because I agreed. I thought we could achieve better color, better tannin extraction, better pH levels." Together with Nesbitt's winemaker,



Merlot grapes in Simpson Meadow Vineyards (Madera, CA).

WINEGROWING

Darrin Petersen, Nesbitt created wines from these experimental plots.

With Williams focused on quantifying the interaction between irrigation amount and canopy management practices, Simpson, Nesbitt, and Petersen focused on producing superior quality wines from San Joaquin Valley grapes, the study provided an opportunity to define vineyard practices that achieve those goals. However, it would take five years before the results were known.

Research methods / procedures

The study commenced in Simpson's Merlot vineyard in Madera County in 2001. Bilateral-cordon trained vines were planted on their own roots in east-west rows and spaced 7 feet x 12 feet. The trellis system is described as California "sprawl."

Merlot was chosen because, at the time, it was one of the red grapes

Simpson had planted in a large enough quantity (40 acres) to fill Williams' request for the research. A total of nine treatments were imposed.

Irrigation treatments consisted of applied water amounts at 0.4, 0.8, and 1.2 of estimated vineyard evapotranspiration (ET_c), while the canopy management treatments consisted of leaf removal on both sides of the fruit zone either at berry set or veraison. The control was no leaf removal.

Vine water status (midday leaf water potential) was monitored with a pressure chamber throughout the growing season, and the amount of light in the fruit zone was measured. Pruning weights were recorded.

Berries sampled prior to harvest were analyzed for soluble solids, titratable acidity, and pH. Yield, yield components, and pruning weights were analyzed with a three-way analysis of variance (including irrigation treatment and canopy management).

Wine was made with the harvested fruit from five of the nine treatments in 2002. Wine was made from all nine treatments in 2003 and 2004. Approximately 1,000 lbs. of grapes from each treatment were used to make small-lot wines at Chumeia Vineyards.

The wines were analyzed for total phenols, tannins, and anthocyanins by Enologix (Somona, CA). Sensory evaluation was conducted on all wines by Williams, Simpson, Nesbitt, and Petersen with the coordination and direction of Dr. Hildegard Heymann (Department of Viticulture & Enology at UC Davis).

Evapotranspiration and leaf removal results

In 2005, five years after Williams began the study, the research concluded. Aside from a few minor glitches, the contributors all agreed that the study went smoothly and were pleased with the accuracy of the data.

To quantify the evapotranspiration equation, Williams calculated the seasonal crop coefficient (K_c) for a California sprawl canopy by measuring the shaded area under the vine.

"It has been shown that the K_c is a linear function of the percent of shaded area cast on the ground beneath the vine at solar noon," explains Williams. Using the following equation: $K_c = 0.02 + (\text{percent shaded area} \times 0.017)$, the K_c can be estimated.

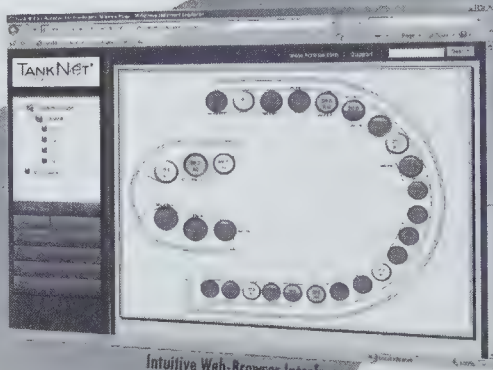
If the reference ET (ET_0) is known, then the estimated vineyard ET (ET_c) is calculated using a second equation: $ET_c = K_c \times ET_0$. For all five years, reference ET was approximately 49.2 inches. The estimated ET_c was 28.1 inches. "The data from this study demonstrates that one approach to irrigation scheduling is to use reliable crop coefficients," reports Williams.

Although the irrigation treatments were scheduled at 0.4, 0.8, and 1.2 of estimated ET_c , the actual applied water amounts were approximately 0.35, 0.72, and 1.05 of the estimated seasonal ET_c . Williams credits this to the fact that the irrigations did not begin until midday leaf water potential was -1.0 MPa, and were sometimes less than what had been requested.

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Mean midday leaf water potentials were -1.11 , -0.93 , and -0.82 MPa (-11.1 , -9.3 , and -8.2 bars, respectively) for the 0.4 , 0.8 , and 1.2 ET_c irrigation treatments. This data was based upon 11 (2001) to 18 (2004) measurement dates taken during the growing season across years.

When the light exposure, leaf removal, and deficit irrigation treatments were evaluated, the no leaf-removal vines showed that the 0.4 and 0.8 ET_c deficit irrigation treatments increased light in the fruit zone when compared to the 1.2 ET_c no leaf-removal treatment.

However, the amount of light in the fruit zone of the 0.4 ET_c treatment (no leaf removal) was significantly less than all irrigation treatments with leaves removed. Therefore, under the conditions of this study, deficit irrigation alone at the 0.4 ET_c level was not sufficient to replace leaf removal and enhance the light environment in the fruit zone.

Leaf removal in the fruit zone did not affect vine leaf water potential. This indicates that leaf removal in the shade has little effect on the overall vine water use. However, the water potential of clusters exposed to direct sunlight was more negative (more stressed) than clusters on the same vine residing in the shade.

Temperatures of clusters in direct sunlight were 10° to 15° F higher than those on the same vine in the shade. Therefore, it would appear that canopy management practices that increase light exposure to the fruit might indirectly affect the water status of a cluster.

High-quality grapes from Madera

When the fruit and wine data were quantified, Simpson's feeling that the San Joaquin Valley can produce high-quality grapes when the vines are given extra care was proved right. "There was absolutely no comparison between the control and the uncontrolled (1.2 ET_c treatment compared to the 0.4 and 0.8 treatments and the no leaf-removal control compared to leaf removal treatments) grapes and wine."

The five-year mean yield of the 1.2 ET_c irrigation treatment was 10.3 tons per acre, while the 0.4 and 0.8 ET_c irrigation treatment yields were 65% and 87%

of that value. Leaf removal at berry set reduced yield by 7% compared to the no leaf-removal control. Leaf removal at veraison reduced yield by 3%; this could be explained by the inadvertent removal of clusters when leaves were removed.

Water effect on berry composition

According to the results of the study, "Irrigation and canopy management treatments and year significantly affected berry weight." When applied water increased, so did berry weight: the 1.2 ET_c irrigation treatments' mean berry weight over five years was 245 g per 150 berries, significantly larger than the 0.4 ET_c treatment at 198 g, or the 0.8 ET_c treatment at 235 g.

Titrate acidity also increased with applied water, with 2001 producing the highest yearly TA mean (5.75 g/L). The 1.2 ET_c irrigation treatment soluble solids mean was 20.9° Brix, while those of the 0.4 ET_c and 0.8 ET_c treatments were 22.8° and 21.8° Brix, respectively.

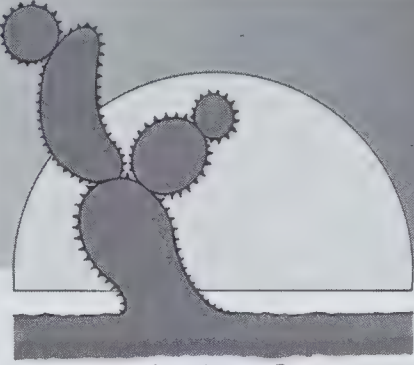
Berry weight decreased significantly when leaves were removed within the fruit zone, possibly due to the light's impact on water loss, which then impacted berry weight. In 2005, the 0.4 ET_c irrigation treatment with no leaf removal yielded a berry weight of 233 g per 150 berries, while the berry set and veraison leaf removal treatments yielded 217 g and 214 g per 150 berries, respectively. This trend was consistent throughout the five years.

Year significantly affected pH, and 2004 had the highest levels, with a mean of 3.76.

Wine Laboratory Analysis and Sensory Evaluation results

Wines were made from each treatment in 2002, 2003, and 2004, and then tested for total phenols, tannins, and anthocyanins.

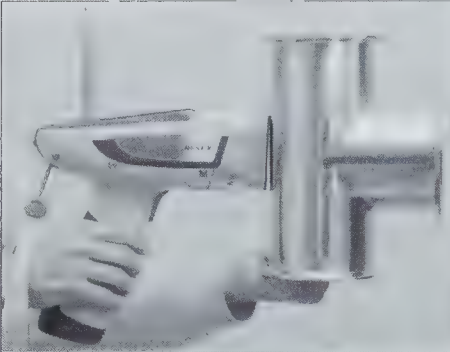
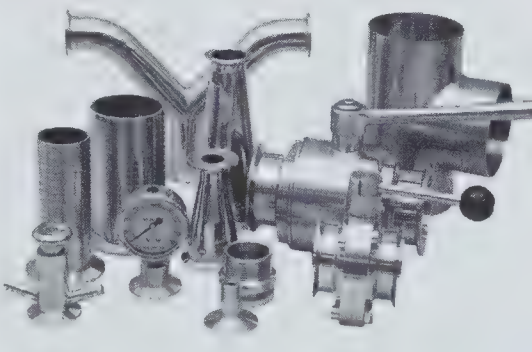
The 0.8 ET_c irrigation treatment had the highest levels of total phenols and tannins in 2004, and these same factors



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increased when leaves were removed at berry set. Overall, regardless of timing, of leaf removal, anthocyanins increased when leaves in the fruit zone were removed.

Sensory evaluation of the 0.4 ET_c irrigation treatments revealed what Williams called "much higher chemical tastes and aromas" compared to the other two irrigation treatments. For the 0.8 and 1.2 ET_c irrigation treatments, leaf removal at berry set resulted in decreased vegetative taste and aroma, in comparison to leaf removal at veraison or no leaf removal.

The 0.4 ET_c irrigation treatment with no leaf removal exhibited the lowest astringency. Williams indicates that this was probably due to that treatment's lower tannin levels in the wine.

Conclusion

Williams concludes that there were some surprising findings in the study. "When one examines the wine compo-

sition data," reflects Williams, "the canopy management treatments (whether leaf removal occurred at berry set or veraison) had a greater effect on total phenols, tannins, anthocyanins, and wine attributes than the deficit-irrigation treatments."

The study seems to suggest that leaf removal in the fruit zone of a California Sprawl canopy allows more light to reach the clusters, which may enhance wine quality constituents.

"This is surprising since it is often assumed that leaf removal in the fruit zone of vines growing in the San Joaquin Valley is not good for wine quality [because]," explains Williams, "too much light on the fruit will result in very high cluster temperatures and perhaps sunburn problems.

"I feel the reason that leaf removal proved beneficial in this study, despite being conducted in San Joaquin Valley, was due to the fact that leaf removal in the fruit zone for a California sprawl

canopy, (with shoots growing above along with laterals), resulted in more light penetration to the cluster region but minimized sunburn since lateral shoots shaded the clusters throughout the day."

Perhaps the most obvious (yet essential) proof of a study's importance is its applicability in the vineyard. If this is the case, Williams' study has certainly proven its worth. Simpson knows of several Madera growers who have implemented the techniques learned from the research, and he is currently using the irrigation practices from this study in two acres of Pinot Noir vineyards in Madera.

Williams acknowledges that "there are crop consultants and large grape growers using the crop coefficients I've developed in this study (for a California Sprawl canopy) and other types of canopies to schedule irrigation in their vineyards."

Like all good research, the findings from this study serve as a building block for further studies. "In the future," says Williams, "I may plan on extending the results from this study and investigate the use of different trellis systems in San Joaquin Valley to improve the light environment within the fruit zone to increase wine quality and minimize sunburn."

While Williams plans to investigate the methods of the study on various trellis systems, Nesbitt has decided to implement the findings from the study in new San Joaquin Valley vineyards, where he is double-pruning vines to delay fruit maturity in Chardonnay, Merlot, and Primitivo. Nesbitt is "excited because we get to pick up where we left off, and try the research methods on other cultivars."

When asked about their thoughts on the study, Williams, Simpson, and Nesbitt agree: the time and money invested on this experiment was well worth the information obtained, and all look forward to Williams' future research on other trellis systems in the San Joaquin Valley ■

This research was partially funded by the American Vineyard Foundation.



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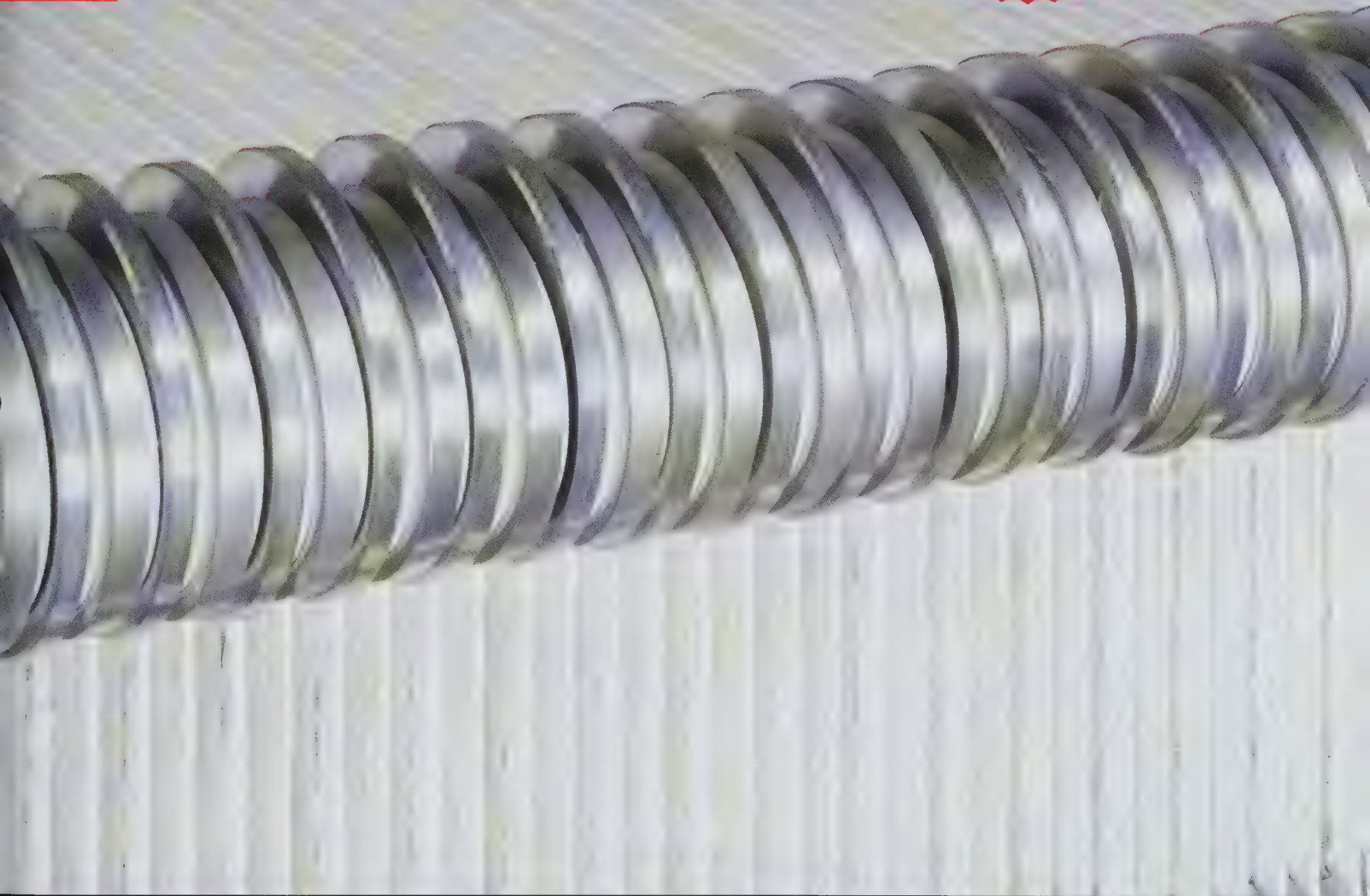
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VARIETAL REVIEW

California white Rhône

Continued from page 16

In the Core cellar

Grenache Blanc is picked between 23° and 28° Brix with 3.4 to 3.9 pH. Roussanne Brix range is 25° to 27° with 3.6 to 3.9 pH. Marsanne ranges 24° to 26° Brix and 3.5 to 3.7 pH. TA is not measured for any variety.

Clusters are destemmed and left on the skins overnight. Some lots of Marsanne and Roussanne have 5 to 6 days of skin contact before treading. Also, some hard-pressed fractions offer interesting flavors.

Depending on fruit condition, 50 to 100 ppm SO₂ is added at crush. Fermentation in both oak barrels (if new, only three weeks) and stainless steel barrels are inoculated with D21, D47, D254, and QA23 yeast cultures for a fermentation lasting eight to nine months.

Wine does not undergo MLF, but lees are stirred for as long as needed. Wine is not fined, but undergoes sterile filtration before bottling.

In the Andrew Murray cellar

Grenache Blanc is harvested at approximately 25° Brix, but is dependent on pH rising to between 3.30 and 3.50. Roussanne is at similar Brix with a pH under 3.70.

At the press, 50 to 60 ppm SO₂ is added and juice is cold-settled overnight. "I add a higher amount of SO₂ to Roussanne (occasionally up to 70 ppm)," Murray notes, "because it comes into the winery so highly colored and gets pinker and browner during pressing."

Fermentation is inoculated with D254 and cold fermented in tank at 50°F for 45 to 60 days. MLF is inhibited and the lees are not stirred. When needed for further development, wine is aged in neutral French oak for no longer than three months. Except for cold stabilizing, no fining is done. Wine is sterile filtered at bottling.

In the Tablas Creek cellar

Roussanne is harvested at 22.0° to 26.0° Brix, with TA 6.0 to 8.0, and pH 3.45 to 3.70. Grenache Blanc harvest

parameters range 23.0° to 26.0° Brix, TA 8.0 to 9.0, and 3.15 to 3.30 pH.

First SO₂ addition at 40 ppm occurs at the crush pad. Whole cluster fermentation is uninoculated and can last anywhere from four weeks to six months. Temperature peaks at 85°F.

Roussanne was fermented half in stainless steel tanks and half in small oak cooperage (10% new French oak). Formerly, Grenache Blanc was tank fermented, but now, a portion is fermented in 1,200-gal ovals. Both Viognier and Marsanne are tank fermented.

Lees are stirred as needed and most wines undergo uninoculated MLF. Blending occurs in May, followed by cold stabilization and bottling in July without fining, but filtered if needed.

In the Treana cellar

Harvest windows for both Viognier and Marsanne are similar at 26.5° to 27.5° Brix, 5.5 to 6.5 TA, and 3.65 to 3.75 pH. All varieties are whole cluster pressed and cold settled at 30°F before transfer to cooperage, which is 20% new French oak and up to three years old. A small portion of juice is tank fermented.

A slow 10- to 15-day fermentation with Premier Cuvée peaks in barrel at 75° to 85°F. In tank it's 40° to 50°F. Half the wine undergoes uninoculated MLF. Wine remains on lees, stirred three times, until bottling. Both fining and filtration are done before bottling when the wine receives its only SO₂ addition (20 to 30 ppm).

Last drop

Beyond site personality of vineyard sources and cellar techniques used to enhance aroma, flavor, and palate impressions, the last drop comes down to as Andrew Murray defines it, "what the goal is."

Murray and other interviewed winemakers have slowly shifted and broken away from Rhône examples and no longer hold them up as the highest wine achievements. Their goal is to make California regional blend expressions of white Rhône-origin varieties. ■

TASTING NOTES

Beckmen Vineyards 2005 Le Bec Blanc, Santa Ynez Valley — \$20

(57 percent Roussanne, 30% Marsanne, and 13% Grenache Blanc)

Color/Aroma: straw colored; stone fruits, apple, pear, mineral, fennel, honey, vanilla, and petrol.

Flavors: peach, apricot, apple, nuts, marzipan, mineral, and toasty.

Balance/Finish: Slight oak notes, good acidity, stunningly rich mouthfeel, and great balance.

Core 2006 White Wine, Santa Barbara County — \$21

(75% Grenache Blanc, 17% Roussanne, and 8% Marsanne)

Color/Aroma: golden; nutty almond, toasty, stone fruit, honeysuckle, honey, and ripe apricot.

Flavors: lively, fleshy, peach, stone fruit, apricot, honey, spicy, mineral, aromas follow through on palate, and complex.

Balance/Finish: good balance, long, rich, restrained oak, nice mid-palate and weight.

Andrew Murray Vineyards 2007 RGB, Santa Ynez Valley — \$25

(60% Grenache Blanc and 40% Roussanne)

Color/Aroma: pale yellow; floral, bright, high-toned fruit, banana peel, green apple, and nutty.

Flavors: stone fruit, ripe peaches, pineapple, melon, grapefruit, crisp pear, banana cream, and mineral.

Balance/Finish: long, well made lighter style, and good food wine.

Tablas Creek 2006 Esprit de Beaucastel Blanc, Paso Robles — \$38

(65% Roussanne, 35% Grenache Blanc, and 5% Picpoul Blanc)

Color/Aroma: straw yellow; floral, honey, apricot, pineapple, spicy, beeswax, and complex.

Flavors: mineral, wet stone, mirroring aromas, stone fruit, and crisp green apple.

Balance/Finish: well-balanced oak, long, and rich.

Treana 2006 Mer Soleil Vineyard, Central Coast — \$25

(55% Viognier and 45% Marsanne)

Color/Aroma: straw colored; honeysuckle, white peach, lemon zest, buttery, nutty, and honey.

Flavors: honey, butter cream, stone fruits, peach, apricot, apple, and some mineral notes on mid-palate.

Balance/Finish: lush, long, rich, good weight, well-balanced and crisp with nice oak lift.

PWV Journal thanks Tablas Creek Vineyard for hosting the discussion/tasting.

Questionable wine excise tax increases

BY Bill Nelson, President, WineAmerica, Washington, D.C.

As the United States faces a severe economic and public finance crisis, cash-strapped states and perhaps the federal government are considering increasing excise taxes on wine, beer, and spirits.

Tax policy is extremely complex because the economic effects of changes can be widespread, unpredictable, and have seriously adverse effects on certain economic players. Nowhere is this more significant than excise taxation, which by definition is product-specific rather than broad based.

Excise tax increases affect consumer demand for particular products. Consequently, the economic prospects of those who produce, market, and rely on those products for their livelihood are affected by revisions to excise tax rates.

Increasing wine excise taxes is questionable policy

Typical reasons to increase excise taxes are: 1) as a user fee (tires and gasoline) to reimburse the societal costs associated with use of the product; 2) as a means of reducing demand for the product because it is considered detrimental to society (tobacco); or 3) as a luxury tax (sailboats and cars above a certain price). None of these justifications can be rationally applied to an increase in wine excise taxes.

1. User-Fee

Consumers of wine typically are moderate consumers, and as such do not impose net costs upon the domestic health care system. Increasing excise tax as a so-called "user fee" would, therefore, not make good policy sense.

The 2005 Dietary Guidelines Advisory Committee — a group of

experts to advise the Secretaries of Health and Human Services and U.S. Department of Agriculture — states that 95% of Americans who drink wine consume only light-to-moderate amounts. Studies have indicated that light to moderate consumption, especially of wine, is associated with certain health benefits.

The Guidelines Advisory Committee states: "studies conducted around the world consistently show that alcohol has a favorable association with total mortality among middle-age and older adults. A meta-analysis on all-cause mortality using approximately 50 studies demonstrated an inverse association between moderate drinking and total mortality under all scenarios. On average, the relative risk of all-cause mortality associated with moderate drinking was approximately 0.80. The J-shaped curve, with the lowest mortality risk occurring at the level of one to two drinks per day, is likely due to the protective effects of moderate alcohol consumption on coronary heart disease and ischemic stroke, the first and third leading causes of death in the U.S., respectively." (citations omitted).

2. Detrimental Product

Wine production is an important tool for growing rural economies. It provides employment, investment opportunity, and economic stability. Taken together with wine's cultural association as a complement to food and a healthy lifestyle — not inebriation — it would be misleading to classify wine consumption as "detrimental to society."

3. Luxury Tax

Wine is not a true "luxury" item as it is typically consumed by Americans across the economic spectrum. Average moderate wine consumers would be the first to reduce consumption following an excise tax increase. Imposing such a tax would accordingly negate the health benefits that result from moderate consumption, but fail to achieve the intended purpose of a luxury tax, namely, targeting consumers most able to afford it.

Because wine is not a luxury item, taxing the consumption of wine by typ-

ical consumers is regressive and does not target those consumers most able to afford it.

Increasing wine excise taxes will seriously damage the economic prospects of America's farm-based family wineries. In addition to policy reasons outlined above, a change in excise tax would also have a devastating economic impact on wineries, other industry members, and consumers.

Grape Overproduction — If wine consumption drops because of increased wine taxes, grape overproduction will result in devastating decreases in grape prices. Vineyards are an expensive, long-term investment in a perennial crop not easily converted to other types of agricultural uses. The only viable use of wine grapes is to make wine.

Exaggerated Cost — Wine excise taxes are applied at the producer level, thus the impact of a wine excise tax increase, if passed along to the consumer, would be exaggerated by wholesaler and retailer standard percentage markups. The excise tax rate increase would accordingly be felt by consumers not at the cost of the excise tax, but at more than **DOUBLE** that dollar value.

Loss of Profitability — Because wine is sold at specific price points to attract targeted demographics of consumers, excise tax changes are difficult to pass on to the consumer. This is particularly true given the way mandatory distribution channels exaggerate excise tax increases.

Following an excise tax increase, wineries are likely to absorb the additional excise tax payment for at least several years until a new price point is established. Under these circumstances excise tax increases come directly from the winery's bottom line.

We estimate that a \$.75 per gallon increase in wine taxes would have the effect of reducing a typical middle level wine producer's gross sales by as much as 5%, possibly eliminating most of the producer's profit margin.

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March/April 2009

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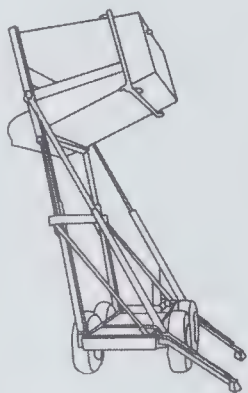
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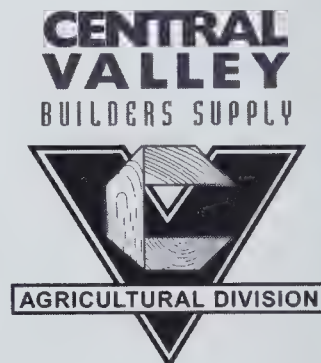
PLEASE SEE VINTAGE NURSERIES AD, PAGE 20.

CENTRAL VALLEY BUILDERS SUPPLY

Central Valley Builders Supply (CVBS) opened its doors in 1955 to supply building materials to surrounding builders. Since then, CVBS has grown into one of the largest suppliers of vineyard products and irrigation supplies in the industry, supplying customers not just in wine country, but all over the U.S. and abroad.

The CVBS Agricultural Division carries a large assortment of trellising, fencing, irrigation, drainage, erosion control, pruning, spray, Macrobins, harvest supplies, and much more. Visit the website, www.cvbsupply.com, for a complete list of suppliers and links, or call one of the three locations.

CVBS opened its fifth location (third store focused on ag products) in Healdsburg, CA in 2006. Healdsburg is a 10,000 sq ft. store with a 1.5-acre materials yard, completely designed around everything an agricultural or vineyard customer would need.



As CVBS expands into new territories, the commitment continues to be the same: A total vineyard supplier that is responsive, flexible, and creative in solving customer needs. With a distribution facility and a fleet of delivery trucks, CVBS Ag Division has the materials customers need, with the ability to deliver the product where customers need it most, on the job, and on time. To schedule a call or jobsite visit by a sales professional, contact CVBS.

For more information contact:

Central Valley Builders Supply

1100 Vintage Ave., St. Helena, CA, 94574

tel: 707/963-3622; fax: 707/963-8952

1790 Soscol Ave., Napa, CA, 94559

tel: 707/257-8888; fax: 707/261-2962

160 Grant Ave., Healdsburg, CA, 95448

tel: 707/473-9722; fax: 707/473-9688

PLEASE SEE CENTRAL VALLEY BUILDERS AD, PAGE 24.

D&S Ag Designs

D&S Ag Designs specializes in innovative trellising systems for vineyards. D&S Open Arbor Systems offer practicality and easy installation — no drop-pers, brackets or clips — and are designed at the optimum angle for fruit clusters to hang individually.

D&S offers the V-rod, designed to minimize field installation and composed of equal-length parts for quick, straight assembly, and sliding locks to prevent V-rod failure. Rake wire brackets slide on to tighten rake wire, or easily move wires to “in” or “out” positions on the assembly.

D&S Ag Designs

The Neva sink is a newly-designed specialty part by D&S, modifying the original bent anchor plate to reduce the amount of steel while maximizing support strength to the end-posts, all without plate bending.

D&S high-tensile wire has class III coating, is guaranteed to last the life of a vineyard, and is available in several gauge strengths.

The D&S IPA Arbor has a flatter canopy than most trellis systems, with the first rake position at 3" to 4" past the spurs, and the second at an additional 4" to 5", minimizing shoot cane crossover. It allows maximum sunlight to the spurs to increase fruitfulness, and good color on varieties that have been difficult to color. With four crossarm parts, the completely-adjustable IPA system can be altered to suit many vineyard needs.

For more information contact:

D&S Ag Designs

6944 Avenue 304, Visalia, CA 93291

tel: 866/594-9943; fax: 559/651-2161

e-mail: devin@dandsagdesigns.com

website: www.dandsagdesigns.com

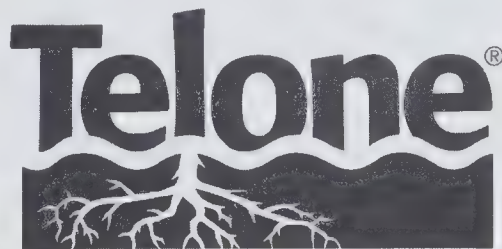
PLEASE SEE D&S AG DESIGNS AD, PAGE 48.

DOW AGROSCIENCES LLC

New vineyard plantings should provide decades of productivity. Considering the massive undertaking and expense of planting a new vineyard, soil fumigation is strongly advised where nematodes or “replant disease” are present.

Soil fumigation using Telone® soil fumigant creates a zone of protection around roots, allowing them to develop in an environment where nematodes are controlled and soil-borne diseases and viruses (such as grape fanleaf virus) are managed. The result: extensive, healthy root systems capable of producing decades of high-quality, high-yielding grapes.

The increased growth provided by Telone® (compared to untreated) is so dramatic that the cost of fumigation is often paid for with the first crop harvested. Plus, starting vines with a healthy, strong root system leads to many other benefits such as generating early growth response, promoting plant longevity, creating more efficient use of water and fertilizer and allowing for more rootstock choices.



Everything grows better.™

To order the FREE guide, Managing Nematodes and Replant Disease in Orchards & Vineyards, call 888/395-PEST.

For more information, contact:

Dow AgroSciences LLC

9330 Zionsville Road, Indianapolis, IN 46268

tel: 888/395-PEST

e-mail: info@dowagro.com

website: www.dowagro.com

EURO-MACHINES, INC.

As a leading supplier to North American wineries, Euro-Machines has expanded its team with experienced staff members in 2009. Stan Schumacher joined as Sales Manager for Idaho, Washington, and the Midwest, and Kraig Taylor is the new Parts and Service Manager for the west coast office.

BRAUD state-of-the-art technology provides top-quality harvesting and full multi-function capability. The cab on the self-propelled chassis is sealed and pressurized for noise reduction and spray safety. A multi-function lever controls all harvester functions with pre-set picking programs and all multi-function attachments. Hydrostatic transmission with cruise control is standard.



Euro-Machines Vineyard and Winery Equipment

The harvester head has a patented quick-shaker rod engagement; enabling activation of more or less shaker rods as the fruit zone requires. Varying leaf volumes on the vine, picking conditions, and grape varieties are easily handled by the operator viewing the picking process on a color monitor. Adjustments are just a fingertip away on the multi-function lever.

Four highly efficient cleaning fans remove all leaves. For optimal cleaning efficiency, an optional patented destemmer makes it possible to destem and eliminate any MOG. The result is the cleanest fruit delivered to a winery by mechanical harvesting.

For more information, contact:

Euro-Machines, Inc.

East: 540/825-5700

West: 497 Edison Court Ste G

Fairfield, CA 94534

tel: 707/864-5800; fax: 707/864-5879

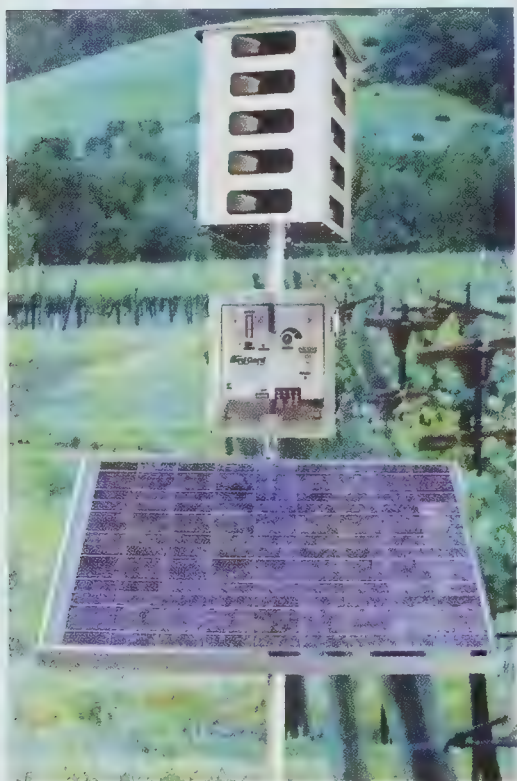
e-mail: info@euromachinesusa.com

website: www.euromachinesusa.com

PLEASE SEE EURO-MACHINES AD, PAGE 32.

BIRD GARD/JWB MARKETING LLC

The Bird Gard Mega PRO's 200-watt amplifier is 60 times more powerful than the Bird Gard Super PRO and covers up to 30 acres. Included with the Mega PRO is a 20-speaker tower, and a 40-watt solar panel. List: \$3,300; Discount: \$2,500.



"Had the starling flocks been there, we would have lost \$20,000 to \$30,000 worth of grapes," Hazlitt 1852 Vineyards, New York.

"The MegaPRO reduced our damage from crows in apples from 10% to just 2 apples in 2008. It did a great job on 23 acres of cherries too," Steven Kalchik, Northport, MI.

"It increased our yield of sweet cherries from 60,000 lbs to 80,000 lbs on 8 acres," Steve Sobkowski, Old Mission, MI.

For more information, contact:

Bird Gard/JWB Marketing LLC

Jim Burton

2308 Raven Trail, West Columbia, SC 29169

tel: 800/555-9634; fax: 803/796-0654

website: www.birddamage.com

DUARTE NURSERY, INC.

Choose Duarte Nursery Big Pot Benchgrafts for your vineyard; measure the quality by their performance. Duarte offers Big Pot Benchgrafts with a guaranteed stand and free delivery in most of California and Oregon.

Duarte offers one of California's best vineyard service teams. A Duarte viticultural consultant is available to provide sales and service throughout California and Oregon grapegrowing regions.



With the use of Big Pot Benchgrafts and consultation from Duarte's vineyard service team, you're guaranteed a successful planting.

Duarte defines quality as your complete satisfaction. Please call today.

For more information, contact:

Duarte Nursery, Inc.

1555 Baldwin Rd., Hughson, CA 95326

tel: 209/531-0351; fax: 209/531-0352

e-mail: sales@duartenursery.com

website: www.duartenursery.com

PLEASE SEE DUARTE NURSERY AD, PAGE 77.

WEED BADGER DIVISION

Thirty years of developing precision in-row rotary tillers and mowers and working factory-direct with growers has led to the release of yet another Weed Badger® machine package.

The Model 4400 Weed Badger® is designed for small, fuel-efficient tractors. This new model is available with the same variety of interchangeable tines and optional tools as the Model 4200. Weed Badger® 4400 Models operate on any tractor with engine horsepower between 18 to 30 HP, equipped with a PTO, and three-point hitch with lift capacity of 840 lbs.

Wrap-around, up-front visibility, exclusive Weed Badger® ground tracking, along with precision Posi-Depth control, is standard on this model. A self-contained PTO-driven hydraulic system eliminates any concerns about tractor hydraulic capacity. Manual retract and extend is controlled with a simple joystick-operated hydraulic control. The ergonomically designed control offers a natural hands-on feel when operating. On-the-go side-to-side adjustable tilt is standard on the Model 4400.



The 4400 Weed Badger® can be purchased as a cultivator, as a mower-only machine, or as a combination cultivator/mower machine utilizing the 3875 Mower Attachment.

See the website www.weedbadger.com. Call 800/437-3392 or e-mail inquiry@weedbadger.com.

For more information, contact:

Weed Badger Division

5673 95th Ave. SE, Marion, ND 58466-9718

toll-free, USA and Canada: 800/437-3392

tel: 701/778-7511; fax: 701/778-7501

e-mail: inquiry@weedbadger.com

website: www.weedbadger.com

PLEASE SEE WEED BADGER AD, PAGE 44.

A&J VINEYARD SUPPLY, INC.

A&J Vineyard Supply was established in May 2002 to contribute to the agricultural efforts of the Napa Valley. Today, A&J's honest approach and many hours of hard work has led to expansion of service not only in Napa Valley, but to all major grape growing regions in the U.S.



Manageable growth of the business keeps high quality control and product availability consistent. Service is the top priority at A&J Vineyard Supply. Whether a customer has 300 acres or 3 vines, A&J provides timely responses, competitive prices, realistic lead times, and the most appropriate products for each project.

A&J is constantly adding to the product line. New items for 2009 include gloves, safety glasses, fence post cement, brown tie tape, erosion control blankets, lopper holsters, TieFix tying supplies, and sub-surface drainage products. A&J's new, improved website and on-line catalog provide photos and information on the entire line of vineyard trellising supplies.

The entire team at A&J Vineyard Supply is dedicated to customer service. From the sales team to the yard crew, A&J constantly strives to set itself apart from the competition. Call or stop by the yard to experience the A&J Vineyard Supply difference.

For more information, contact:

A&J Vineyard Supply Inc.

Augusto Di Battista: 707/963-5354

Cliff Little: 707/477-9002

Antonio Zamora: 707/963-5354

900 N. Crane Ave., St. Helena, CA 94574

tel: 707/963-5354; fax 707/967-8242

website: www.aj-vineyardsupply.com

PLEASE SEE A&J VINEYARD AD, PAGE 38.

RAY CARLSON & ASSOCIATES, INC.

Did you know that you could increase the profitability of your vineyard using GIS?

GIS — How can growers manage it if they haven't measured it? A Geographic Information System (GIS) ties maps to a database.

Ray Carlson & Associates have vineyard consultants, PCA, and a GIS team on staff to help:

- **Organize** data — and obtain vital knowledge from key personnel;
- **Prepare** for regulations — governmental or environmental;
- **Improve** management, grapes, and the vineyard team using GPS to locate critical utilities.

...Plus much more!

Mapping — Appellation custom color appellation maps, showing a winery or vineyards, are a unique marketing tool. Ray Carlson & Associates has aerial photo and mapping resources ready to create a distinct map.

Surveying — A current survey may help increase property value.

GPS — Ray Carlson & Associates uses the latest technology, but believes that high-tech will never replace high-touch.



Ray Carlson & Associates combines a variety of high-quality products with dedication to customers and their needs, and have been surveying and mapping land in Sonoma County and surrounding California counties since 1976.

For more information, contact:

Ray Carlson & Associates, Inc.

411 Russell Ave., Santa Rosa, CA 95403

tel: 707/528-7649; fax: 707/571-5541

e-mail: rca@rcmaps.com

website: www.rcmaps.com

PLEASE SEE RAY CARLSON & ASSOCIATES AD, PAGE 49.

KIMCO MFG., INC.

If you want to reduce the cost of controlling in-row weeds, Kimco Manufacturing has an answer. The Kimco Model 9300 is a heavy-duty in-row tiller that operates in virtually any vineyard. It can remove weeds — including just-sprouted and those that have grown up into the vine canopy. The Kimco 9300 works well under extreme conditions, and is gentle on young vines.

Designed specifically to work under drip lines, the Kimco 9300 works in soil conditions that other machines cannot, from sand to clay to rocks in virtually any combination. It does all this often more effectively and at a lower cost per acre than chemical weed control.



The Kimco is always mounted ahead of the operator for best visibility and operator convenience. The operator has fingertip control of all machine functions. The automatic vine sensor can easily be overridden by the operator, and the tilling depth can be adjusted on-the-go.

With many years of proven durability, the Kimco Model 9300 in-row tiller and its companion, the Kimco M-9700 in-row mower, have proven to be very cost-effective devices to mechanically control in-row weeds.

For more information, contact:

Kimco Mfg., Inc.

9200 W. Barstow Ave, Fresno, CA 93723

tel: 559/277-9300 or 800/356-9641

fax: 559/277-9358

e-mail: sales@kimcomfg.com

website: www.kimcomfg.com

PLEASE SEE KIMCO AD, PAGE 74.

CALIFORNIA GRAPEVINE NURSERY, INC.

California Grapevine Nursery, certified by the California Department of Food & Agriculture, provides grape-growers with high-quality planting materials. Available products include dormant rootstock and dormant grafted vines, at very competitive prices.



CALIFORNIA GRAPEVINE NURSERY

Choose from 21 varieties of certified rootstock including the French-developed Gravesac variety. A large selection of scion varieties and clones, including ENTAV-INRA® clones to customize your grafted-vine order, is also available. California Grapevine Nursery is a licensed agent of ENTAV-INRA® material in the U.S. with authentic clones from France.

California Grapevine Nursery employs state-of-the-art nursery practices to assure clean, healthy, and productive grapevines. An integrated pest-management program is utilized to carefully monitor vines and treatments are applied only when absolutely necessary. An integrated fertilization program provides vines with proper nutrition along with preplant soil conditioning. All vines are hot water-treated at no extra charge.

California Grapevine Nursery is dedicated to providing customers with the highest quality plants available and excellent, efficient customer service.

For more information, contact:

California Grapevine Nursery, Inc.

1334 Vidovich Ave., Suite A

St. Helena, CA 94574

tel: 800/344-5688; fax: 707/963-1840

e-mail: sales@californiagrapevine.com

website: www.californiagrapevine.com

PLEASE SEE CALIFORNIA GRAPEVINE NURSERY AD,
PAGE 13.

AgCode, INC.

AgCode has designed an information management solution to meet the unique needs of the vineyard industry. AgCode's Total Ranch Solution is a complete field-data collection system featuring a premier field payroll solution, including payroll data collection and pay rule processing.

Total Ranch includes production planning and budgeting, resource data collection (including equipment and chemical), viticulture scouting, and phenology tracking.

AgCode's full reporting suite allows users to go from "dock to doc" by docking the handheld to synchronize data to the web and create business-intelligence documents tailored to their needs.



Payroll and production data collection is more efficient and precise by combining Windows Mobile technology, bar code scanning, GPS technology, secure web-based data systems, and AgCode's Command Code technology.

AgCode's premier payroll solution allows supervisors to record time and productivity of a field labor force and collect information on the worker, crop harvested, or application performed while in the field. Payroll data is collected in the field using Windows Mobile handheld technology by using a Palm® Treo™ or TDS Nomad™. The data is then synchronized to a secure website where pay rules are calculated. Employee hours can be viewed, audited, and approved for export into any back-office software.

For more information, contact:

AgCode, Inc.

608 W Fifth St., Starbuck, MN 56381

tel: 877/250-8435; fax: 320/239-7312

THE WINEGROWING CONSORTIUM

Dr. Paul Anamosa: Vineyard Soil Technologies

Nathan Baty: Viticultural Services

Mike Bobbitt: Mike Bobbitt & Associates

Tucker Catlin: Estate Vineyard Design & Development

Dr. Mark Greenspan: Advanced Viticulture

Dr. Daniel Roberts: Integrated Winegrowing

Dr. James Stamp: Stamp Professional Viticulture Services

After years of collaborating on vineyard design, wine quality improvements, and technical troubleshooting, these independent viticulturists have joined to provide an integrated service. Consortium members are committed to working closely with owners, winemakers, and vineyard managers to improve wine quality while achieving financial efficiency.

Clients — Consortium clients are often wineries with estate vineyards looking to improve wine quality or refocus vineyard activities and grower relations to better support winemaking/marketing goals. Quality, quantity, and costs are all considerations, with most clients in the ultra-premium and luxury categories.

New vineyards — The critical design process begins with a **site assessment** of soils, climate, topography, and wine goals. The final plan integrates blocks with soils and slopes, while selecting the best variety/clone and rootstock, spacing/row direction, and trellis/irrigation combinations for a site. To preserve this design, **ongoing supervision** guides the process through permitting, engineering, budgeting and into planting, training, and production.

Producing vineyards — Long-term winegrowing strategies are also applied to producing vineyards. The effects of pruning, canopy, irrigation, yield, uniformity, and ripening are all integrated to achieve winegrowing goals. For contracted fruit, extensive grower relations experience can evaluate fruit sources and match contracts or leases to winery needs. Design, supervision, and interpretation are available for viticultural experiments and weather data, where GIS maps and data management are incorporated into most projects.

For more information, contact:

The Winegrowing Consortium

tel: 888/897-3030

e-mail: info@winegrowingconsortium.com

website: www.winegrowingconsortium.com

PLEASE SEE THE WINEGROWING CONSORTIUM AD,
PAGE 19.

TURRENTINE BROKERAGE

Turrentine Brokerage knows the wine business inside and out. For wine and grape supplies, and to buy or sell grapes or wines in bulk, including international wines, call Turrentine Brokerage.

Call Turrentine Brokerage for win/win negotiations, personal service, and a comprehensive selection of premium wines and grapes. A UC Davis-educated winemaker and a Fresno State-educated viticulturist are on staff.

Ask about the *Turrentine Collateral Value Report*, inventory appraisal service, the oft-quoted *Market Update* newsletter for in-depth analysis of the grape and wine markets, and the *Turrentine Outlook*, which provides information available about long-term industry trends.



TURRENTINE

GRAPES & WINE

Turrentine has a record of predicting wine business trends, and helping clients profit from them. Turrentine knows the sources of supply, history and capabilities, the brands, people, and finances. Turrentine earns trust and guards confidences carefully; makes deals happen; bring businesses together efficiently, creatively, and quickly. Turrentine understands the key factors that make your business tick, and how to avoid many hidden disasters.

For more information, contact:

Turrentine Brokerage

Steve Fredricks, Vice President/Managing Partner

Michael Robichaud, Broker/Partner

Brian Clements, Senior Partner

Larry Kavanagh, Broker

Erica Moyer, Broker

Bill Turrentine, President/Partner

Matt Turrentine, Broker

Steve Robertson, Broker

Stephens Moody, Broker

7599 Redwood Blvd. Ste. 103

Novato, CA 94945

tel: 415/209-9463; fax: 415/209-0079

e-mail: info@turrentinebrokerage.com

website: www.turrentinebrokerage.com

PLEASE SEE TURRENTINE BROKERAGE AD, PAGE 25.

GROVER SOIL SOLUTIONS

Grover Soil Solutions is committed to providing sustainable solutions for soil through the use of premium compost and custom blends. WonderGrow compost is a well-decomposed, weed-free organic soil amendment. It is derived from yard trimmings, source-separated plant material, and agricultural and food residuals. WonderGrow contains no biosolids, animal waste, or substances toxic to plants. It is free of man-made foreign matter (<1% by dry weight).



Strong, healthy, and productive plants thrive in soils that have an abundance of macro and micronutrients. A healthy soil ecology is sustained by high levels of soil organic matter. Natural decomposition processes constantly cycle nutrients for plant growth, feed soil microbiology, and stabilize the soil's physical environment.

Grover Soil Solutions has a team of ag consultants, PCAs, and CCAs who work to identify soil factors limiting plant productivity. Through soil testing, tissue analysis, and field observation, Grover develops recommendations and customizes compost blends to fit each unique growing environment.

Grover has several spreader configurations available as rentals to meet vineyard needs.

For more information, contact:

Grover Soil Solutions

6224 Stoddard Rd., Modesto, CA 95356

tel: 866/764-5765; fax: 209/545-3315

website: www.wondergrow.biz

PLEASE SEE GROVER SOIL SOLUTIONS AD, PAGE 74.

JIM'S SUPPLY COMPANY, INC.

Jim's Supply Company is the nation's largest full service supplier, manufacturer, and distributor of vineyard and orchard trellising materials. Jim's Supply has been serving the industry since 1959 and celebrates its 50th anniversary in 2009.

With three fully-stocked and professionally-staffed locations, along with a fleet of 20 trucks, Jim's is equipped to meet all needs. A unique manufacturing process allows Jim's to be a leader in price point and overall quality, ahead of its competition. Jim's Team consists of vineyard experts with an average of 16 years of experience in the industry.

Jim's not only carries materials needed, but can design a system to meet vineyard needs, and then fabricate the order inside its manufacturing plant. Jim's is a "go-to" supplier for hard-to-find items, and an industry leader in working to save customers time and money.



From the West to East Coast of North America (Mexico and Canada too), Jim's Supply is a leading supplier for all vineyard needs. Local delivery and nationwide shipping are available.

For more information, contact:

Jim's Supply Company, Inc.

Corporate Office/Manufacturing

3530 Buck Owens Blvd.

Bakersfield, CA 93308

toll-free: 800/423-8016; tel: 661/324-6514

fax: 661/324-6566

Northern CA/Southern OR

4102-A St. Helena Hwy.

Calistoga, CA 94515

tel: 707/942-JIMS (5467); fax: 707/942-9752

Central CA/San Joaquin Valley

Mike Gostanian, tel: 559/930-6165

Central CA/Monterey and Coastal

Scott Spitzer, cell: 661/889-6000

office: 800/423-8016

Pacific NW/Washington Depot

8148 Stateline Road, Touchet, WA 99360

tel: 509/781-0898

e-mail: jimssci@jimssupply.com

website: www.jimssupply.com

PLEASE SEE JIM'S SUPPLY CO. AD, PAGE 2.

VINEYARD INDUSTRY PRODUCTS CO.

Vineyard Industry Products Company (VIP) has supplied trellis systems and supplies to California grape growers for two generations. VIP has a knowledgeable sales staff, competitive prices, and exceptional customer service. VIP carries one of the largest inventories in the industry available for will-call, or can ship direct to the vineyard.

VIP carries everything associated with the vineyard trellis; highway posts, T-Posts, rebar and pencil rod training stakes, crossarms, lodgepoles, steel end-posts, double-welded screw-in earth anchors, class-1 galvanized high-tensile wire, clips to fit all stakes, Gripple brand wire connectors and tighteners, many sizes and types of fencing materials, grow tubes, Bare Hand™ brand bird netting, pruning and tying supplies, and more.



VIP offers the patented (Pat. #5501035 & #5916028) J~R Clip™, designed to fit all size T-posts for vertical trellis system. The versatile clip is installed in seconds and withstands mechanical harvesting and pruning.

For more information contact:

Vineyard Industry Products Co.

North Coast:

10603 Old Redwood Hwy,
Windsor, CA 95492

tel: 707/431-1356; 800/544-2210

fax: 707/431-0807

Central Coast/Santa Barbara:

toll free: 800/491-9833

website: www.vineyardindustryproducts.com

PLEASE SEE VINEYARD INDUSTRY PRODUCTS AD,
PAGE 40.

OXBO INTERNATIONAL CORP.

Offered by Oxbo, the full line of Korvan vineyard equipment includes standard and multi-function grape harvesters and a complete line of mechanization equipment.

Korvan grape harvesters are available in tow-behind, self-propelled, wide-trellis, and multi-function designs. The multi-function Korvan 4012 can be equipped with a 3-row sprayer, dual rear 3-point hitch and front tool bar which make it ideal for year-round vineyard operations.



Every American-made Korvan grape harvester is designed to deliver more high-quality fruit by combining a soft-touch bow rod harvesting system with a gentle bucket line system to gently carry clean, whole fruit to the bin or gondola.

Korvan's complete vineyard mechanization equipment line-up is a comprehensive, integrated set of tool carriers, attachments, and techniques designed to help growers produce higher quality grapes at lower cost with less labor.

The Korvan system features four distinctive tool carriers: a tow-behind unit, single and double row tractor-mounted units, a front tool bar for the 4012 power unit. With a variety of pruner styles and an extensive line of attachments for canopy and yield management — shoot thinners, vine trimmers, leaf removers, cordon brushes, and fruit thinning tools — the Korvan line now provides growers with a trusted source for the quality products needed for today's vineyards.

For more information, contact:

Oxbo International Corp.

270 Birch Bay Lynden Rd., Lynden, WA 98264

toll free: 888/6-KORVAN;

Brent Borboa: 559/281-1883

e-mail: vineyard@oxbocorp.com

website: www.oxbocorp.com

PLEASE SEE OXBO AD, PAGE 39.

LAKE COUNTY GRAPEVINE NURSERY

Lake County Grapevine Nursery is tucked away at an isolated valley location, the northernmost of California's grapevine nurseries, producing healthier, disease-free vines for discerning, value-focused customers.

LCG Nursery is home to 250 acres of well-drained sandy loam for the production of dormant benchgrafts and rootings. The LCG Nursery property includes impressive and well-maintained greenhouses, a robust production facility, and cold storage space.

The high elevation provides a cooler climate in the fall and early winter months, exposing the vines to low temperatures, which guarantees exceptional dormancy and disease control, especially Pierce's disease.

LCG Nursery offers growers a selection of grape varieties, clones, and rootstocks as dormant benchgrafts, potted green-vines or rootings, and own-rooted material.



LCG Nursery is a family-run, full-service nursery with the best facilities and equipment available, plus customer care, attention, and dedication to personal service.

For more information, contact:

Lake County Grapevine Nursery

4887 New Long Valley Road

Clearlake Oaks, CA 95423

tel: 707/998-9674

website: www.lcgn.net

PLEASE SEE LAKE COUNTY GRAPEVINE NURSERY AD,
PAGE 18.

**WINERY
& VINEYARD**

Practical

Please send the following books:

BOOKSHELF ORDER FORM

58-D Paul Dr. San Rafael, CA 94903
Phone: 415/479-5819 Fax: 415/492-9325

Quantity	Title	Price	Subtotal
SHIP TO: Name:			
Address:			
City:	State:	ZIP:	
Subtotal:			
CA add sales tax (8.25%):			
Shipping and handling:			
TOTAL:		\$10.00	

☐ My check or money order (drawn on a U.S. bank) is enclosed.
☐ Please charge my credit card (check one): ☐ Visa ☐ MasterCard

Card Number _____ Expiration Date _____ Security Code _____

Billing address for credit card: _____

Telephone _____ Customer Signature _____



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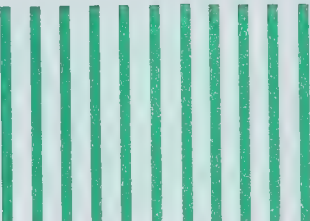
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P.O. Box 3629
San Rafael, CA 94912-9830



PREMIERE VITICULTURAL SERVICES, INC.

Keep vineyard data at your fingertips with PremiereVision®. Designed by experienced viticulturists, the format presents data in ways that help growers make fast and accurate decisions.

Desk time means growers aren't out in the vineyard, so data input forms are fast and simple, data output is tailored to what vineyard managers need, and time-saving calculations are built in throughout the application.



Maps, lab reports, aerial images, and all of the other random papers go in one place for easy access later.

PremiereVision® includes spraying, fertilizing, irrigation scheduling with built-in optional ET calculations, weather degree day tracking, wine-quality feedback, crop estimation, growth monitoring, pest monitoring, irrigation monitoring, block specifications, and nutrient tracking.

PremiereVision® software highlights:

- Quickly view and manage all critical vineyard activities;
- Time-saving work orders;
- Simple, powerful web-based, real-time database;
- No software to install — all data on secure servers, view from any location with a password;
- Use iPhone, Blackberry, or Treo for full access in the vineyard;
- Pricing is on a sliding scale, and there are three levels to choose from — see rates on website.

PremiereVision® (patent pending) is the vineyard database designed by and for viticulturists.

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Premiere Viticultural Services, Inc.

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Spec Trellising

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tel: 800/237-4594, or 215/322-5588

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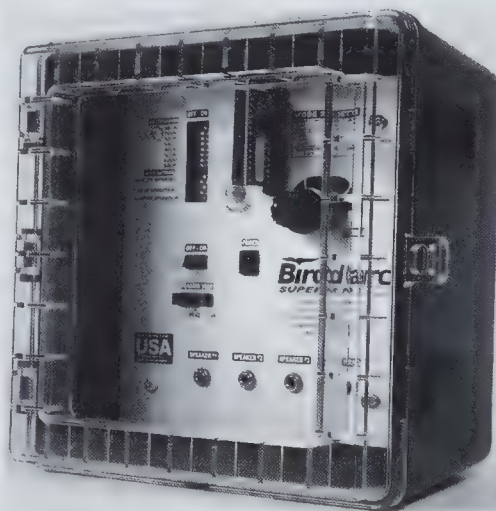
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BIRD GARD, LLC

"Bird Gard" electronic bird repelling products drive unwanted birds away from vineyards, orchards, crops, airports, landfills, and anywhere birds are a problem. Audible bird distress and harassment sounds are digitally recorded onto a microchip and are effective against starlings, robins, grackles, seagulls, woodpeckers, and other pest birds. These sounds are then amplified and broadcast to protect areas from one acre (0.4 hectares) up to 30 acres (12 hectares).



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tel: 541/549-0205; toll-free: 888/332-2328

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website: www.birdgard.com

ADVANCED AGRICULTURAL SERVICES, INC.

Advanced Agricultural Services are offered, for advanced agricultural needs.

Throughout central California, a team of expert consultants assists growers and management companies with tasks from conventional integrated pest management to augmented biological infusion programs.

The goal of Advanced Agricultural Services is to develop and implement programs that improve a grower's bottom line. Advanced Agricultural Services serves vineyard owners with as much diligence as vineyard owners give their crops.

Services offered for conventional and organic crops include:

- IPM specialists;
- Pest and disease consulting;
- Grape fruitfulness inspection;
- Biological infusion programs;
- Nutritional monitoring and advice;
- Research and development.



Advanced Agricultural Services' experts work with all California crops and design programs based on specific needs. After a free consultation, an action plan is developed outlining measurable and meaningful goals that are set into action and monitored on a regular basis.

For more information, contact:

Advanced Agricultural Services

1745 - 10th Ave., Hanford, CA 93230

Devin Carroll: 559/240-5127

e-mail: devinc@sbcglobal.net

Donald Thomas: 805/838-4074

e-mail: Donald@advancedagricultural services.com

office: 559/582-5402; fax: 559/584-1553

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JMS FLOWER FARMS, INC.

JMS Flower Farms offers JMS Stylet-Oil and Organic JMS Stylet-Oil to winegrape growers. The food-grade white oil formulations are valuable tools for growers interested in economical, effective pest control in the vineyard.

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Stylet-Oil can replace sulfur sprays for powdery mildew control. A four-hour re-entry interval, and 0 days pre-harvest interval, allows workers safely and quickly back into the vineyard, with no sulfur irritation.

Stylet-Oil controls plant-feeding mites, mealybug, scale, and leafhoppers. Stylet-Oil is tank-mixable with most fungicides, insecticides, or foliar sprays (10-day interval with sulfur and 14 or more with Captan), allowing flexibility in integrating this material into your spray program.

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Economical and biodegradable, Stylet-Oil is a plus for grape growers seeking safe, effective pest control programs.

For more information, contact:

JMS Flower Farms, Inc.

4423 5th Place SW, Vero Beach, FL 32968

tel: 772/562-8770; fax: 772/562-7202

e-mail: styletoil@aol.com

website: www.stylet-oil.com

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SUREHARVEST, INC.

SureHarvest Farming MIS is a powerful software tool to increase efficiency, conserve resources, cut costs, and improve quality by providing growers with access to data to make informed and timely farming management decisions. With SureHarvest Farming MIS, growers can plan, schedule, record, analyze, and report all vineyard activities including scouting, sampling and food safety; chemical-fertilizer applications, irrigation, yield forecasting, harvest, and labor.



SureHarvest Farming MIS is a comprehensive and flexible farming management software for growers of any size and scale. With the addition of ScanControl's GIS mapping and handheld technology expertise through a recent acquisition, and the integration of a new Labor and Resource Management module, SureHarvest provides growers with robust activity-based cost reporting tools. The new Labor and Resource Management module enables growers to track labor, equipment, and materials costs to the block and sub-division level, providing cost per acre analysis. With in-field or time clock data collection, growers can track by any payment type and evaluate crew productivity on a daily basis.

SureHarvest powers the on-line Sustainability MIS for California's Sustainable Winegrowing Program. SureHarvest Professional Services designs sustainability programs for food and beverage companies. The Protected Harvest eco-certification program, used by Lodi Rules, is managed by SureHarvest.

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SureHarvest, Inc.

2901 Park Avenue, Suite A2

Soquel, CA 95073

tel: 831/477-7797; fax: 831/477-7790

e-mail: sales@sureharvest.com

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PLANTRA® GROW TUBES

PLANTRA®, a North American vine and tree establishment leader, is dedicated to designing products that overcome plant stress and unleash the full growth potential of planting stock. Reducing plant stress leads to accelerated vine and tree growth, slashing field establishment costs.



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PLANTRA® Grow Tubes fuel faster, healthier growth:

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For more information, contact:

PLANTRA®

Steve Tillmann

tel: 800/518-6872; cell: 805/610-9663

fax: 805/462-1378

e-mail: steve@plantra.com

website: www.plantra.com

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AGAJANIAN VINEYARDS

Agajanian Vineyards, wine grape merchant and bulk wine negotiant, provides a variety of services to satisfy its customers' various needs.

Winery Services: Wine Grape Procurement: Agajanian Vineyards assists in finding exceptional values on wine grapes throughout California on a brokerage or full-service basis, and helps assure customers the grapes to fulfill market demand.

Grower Services: Grapes for Sale Listing: Available wine grapes are listed and, once contacted by winery clients, the Agajanian Vineyards' data base will be accessed for a match (no charge).



AGAJANIAN VINEYARDS

Grape Marketing: To find the best possible market for wine grapes, list the grapes as above, and Agajanian Vineyards will actively market the grapes by:

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- Assisting customers with long-term planning

For more information, please contact:

Agajanian Vineyards

North Coast: Chris Rogers

cell: 707/756-2090

Northern Interior: Daniel Garcia

cell: 916/425-6656

Central Coast: John Tufenkjian

cell: 805/975-7001

California: Gary Agajanian

10174 Highway 41, Madera, CA 93636

cell: 707/480-0474

e-mail: gary@agajanian.com

website: www.agajanian.com

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CALIFORNIA SEED & PLANT LAB

California Seed and Plant Lab (Cal-SPL) located near Sacramento (CA), offers plant disease testing and genetic identification of grapevine varieties. The firm was established in 1995 and employs a highly-qualified technical staff (Ph.D. and MS scientists).

Disease diagnosis: Cal-SPL offers a 17-virus PCR test to identify all viruses known to be present in California vineyards. Growers can identify healthy vines and start new plantings from healthy vines. Other economically important diseases including young vine decline (*Phaeoacremonium spp*) are also identified.

Virus elimination: Cal-SPL offers meristem services to eradicate virus infections from your favorite cultivar.

Soil health: Cal-SPL offers analysis of soil and enumerates beneficial microorganisms to such important pathogens as *Agrobacterium* (crown gall) and *Cylindrocarpon* (root rot). The analysis helps growers to choose a suitable organic amendment or compost tea to incorporate into soils for maximum yield.

Variety DNA identification: Genetic testing includes fingerprinting of varieties with an 8-marker DNA test. The fingerprint is compared with the varietal database (Cal-SPL has all varieties grown in California in the database). Fingerprinting service can also provide genetic profiling for patent applications.

For more information, contact:

California Seed & Plant Lab

7877 Pleasant Grove Rd., Elverta, CA 95626

Parm Randhawa, Ph.D.

tel: 916/655-1581; fax: 916/655-1582

e-mail: randhawa@calspl.com

website: www.calspl.com

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ORCHARD VALLEY SUPPLY, INC.

Orchard Valley Supply has been a wholesale supplier for the vineyard, orchard, and winery industries since 1986, by providing quality products, prompt service, and low prices. Orchard Valley provides everything needed between the vine/plant and the wine/fruit.

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Orchard Valley Supply, Inc.

tel: 888/755-0098, fax: 704/455-4952

e-mail: info@orchardvalleysupply.com

website: www.orchardvalleysupply.com

RANCH SYSTEMS LLC

Ranch Systems offers real-time, online microclimate weather stations, soil monitoring, and remote irrigation control for single or multi-ranch applications. Ranch Systems' wireless mesh networking telemetry equipment and online software interacts with a variety of sensors to gather/transmit vineyard information to a secure website for convenient viewing and management.



NEW in 2009 is the RanchMaster RanchCam wireless camera for remote monitoring and security. The camera is designed for ranch managers looking to monitor crop development, prevent theft, view property access, or even track wildlife, and who need the flexibility of an off-grid, solar powered and wireless system. The RanchCam works with Ranch Systems' base stations, to view images from anywhere in the world in near real time via an Internet connection.

With all Ranch System's solutions, customers can view charts, set custom alerts and triggers, generate reports, and activate valves and equipment online, or download information to a spreadsheet for their own calculations.

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Systems are modular, requiring zero programming for flexible and cost-effective coverage of multiple blocks or properties.

For more information, contact:

Ranch Systems LLC

885 Olive Avenue, Ste A, Novato, CA 94945
tel: 415/898-5900
website: www.ranchsystems.com

EP AERATION, INC.

Incorporated in 1991, EP Aeration offers a full range of environmentally beneficial water treatment products and services including irrigation and wastewater treatment, consulting, watershed management, and bio-remediation.



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For more information, contact:

EP Aeration, Inc.

645 D Tank Farm Rd.
San Luis Obispo, CA 93401
tel: 800/556-9251; fax: 805/541-6149
e-mail: info@epaeration.com
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KINSEY AGRICULTURAL SERVICES, INC.

Nutrient management and development for rebuilding vineyard soil quality.

Specific tests are utilized to measure, map for sampling, and analyze vineyard soils. The program is designed to determine nutrient requirements for every significant variation in the soils of each vineyard utilizing **detailed soil tests** combined with **optional GPS technology**. By determining the subtleties of each soil and consequences for grapes from **nutrient deficiencies or excesses**, **potential advantages and/or problems** can be identified and appropriate solutions proposed.

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Using detailed measurements formulated from soil analysis data for managing nutrients, it is possible to define, measure, and **manage soil fertility**.

On-site consultations can be arranged to help establish, achieve, and maintain goals in terms of correctly building up natural soil quality when necessary.

Training programs help to clarify soil fertility requirements. Introductory programs for building and maintaining vineyard fertility will be posted at www.kinseyag.com.

For more information contact:

Kinsey Agricultural Services, Inc.

297 Co. Hwy. 357, Charleston, MO 63834
tel: 573/683-3880; fax: 573/683-6227
e-mail: neal@kinseyag.com
website: www.kinseyag.com

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FREE RUN



Business of Quality

BY John Marshall,
Great River Vineyard/Nursery
Lake City, MN

Midwestern winery owners often report that people who visit their tasting rooms say, "I don't know good wine from bad wine." This suggesting they feel there is some mystery to wine appreciation and they are intimidated by the wine-drinking experience. This lack of comfort keeps potential customers from visiting a winery and often causes them to leave as soon as possible after entering — a phenomenon that translates into lost revenue to winery owners and to grape growers as well.

Learning about "good" wines

Many years ago, before I was actively involved in grape growing, I became fascinated by wine. However, in the 1960s most French wine was very expensive, and authentic, unflavored California wines were difficult to get in Minnesota, where I lived.

Since there was no tradition of drinking wine in the Midwest then and since I had no personal experience with it, I had trouble finding anyone who really knew what "good" wine was or how to identify it. Puzzled by the way columnists and connoisseurs described their experiences in arcane and esoteric terms, I found myself looking for some essential elements that made some wine "good," some "great," and some "bad."

I read an excellent book back then about how the California wine industry had been virtually destroyed by Prohibition, but some growers and winemakers were beginning to grow winegrapes and make quality wines of the old European varieties in the European style again. Inglenook and Beaulieu Vineyards, located across the highway from each other in Napa Valley, vied each year, it was said, to produce the best Cabernet Sauvignon. Charles Krug wines, made by the Mondavi family before the winery broke up in a family dispute, were quality wines that were getting some national distribution.

Wente Bros. (Livermore, CA), were producing quality wines, mostly whites, in the sandy loams around Livermore. On the slopes of Mt. Eden near Saratoga, CA, the legendary Martin Ray was making wines he felt to be of world-class quality and selling them, even in the 1960s, for \$50 per bottle and more. While it would be some years before California wines were on a par with European wines, California was undergoing a rebirth.

Eventually I was able to locate some of these labels and began to try to educate myself. Although the wines mentioned above are now huge, mass-marketed brands, at the time each represented specific vineyards, wineries, and winemakers. I tried these and other wines to see if I could come to appreciate what "good" wine was. But I became fully confused, partly because, despite their renowned reputation today, in the 1960s California grape growers were like Minnesota grapegrowers, new. They were on a steep learning curve.

Imported wines as inherently "good"

I realize now that some of the wines I tried back then were made from unripe grapes and thus were tart, even sour. Was this quality?

I recall having a Chardonnay once with my girlfriend at the time. It had a most awful off-flavor, but we didn't know any better, so I thought that perhaps it was some "quality parameter" that I couldn't appreciate. Fortunately, my girlfriend continued to love me despite having had to suffer through the entire bottle with me. More to the point, all the flavors were so unfamiliar to a neophyte wine drinker that we could not identify what we were drinking, and there was no one around to teach us otherwise.

Those who were teaching about wine were mostly wine importers who were passing off French wines as "good" and American wines (from California and the eastern U.S.) as "bad." We did not realize that these people had a lot to lose by the popularization of local wines and they were serving their own interests by teaching us that dry, tannic, austere wines from France were in and of themselves good. But these wines were made to serve the French palate. As far as any of us Midwesterners could tell, they all tasted like crap. They did not fit our palate, and that is the main reason, I am sure, that few Americans, historically, drank wine.

When we sold grape juice from our salesroom in Minnesota, no one ever came in and said, "I don't know good grape juice from bad grape juice." They knew what tasted good and when they had our juice it tasted great. Everyone knew grape juice and everyone knew what they liked. No mysteries! It is the same with wine.

A Frenchman knows what he likes and asks for it. When local folks stay away from wine because they know what they like and they do not like "good" wines, it does only one thing — it costs the local wineries and the growers that support them real money.

The taste test

The beginning of my real wine education came when I joined the effort to organize the Minnesota Grape Growers Association (MGGA). At meetings, the winemakers brought their wines for all to try. Some were tart, even sour, from

unripe grapes. Some were oxidized, pungent, and unpleasant. Some had odd aromas, but others did not.

Although there was a wide range of wines at most tastings, I began to realize there were simple, plain, even obvious characteristics that made wine pleasant, easy to drink, aromatic, and enjoyable. Good wine was easy to differentiate from bad wine — one tasted good and the other did not. Eventually I realized I did not have to rely on some self-appointed expert to tell me what was good.

One of the worst wines I ever had was a Chateau Margeaux that had been given to Jim Liberko, an MGA Board member, as a gift. It was likely worth several hundred dollars. He shared it with us as he felt we were about the only people he knew that could appreciate it. I read the label and savored the moment, but discovered that it was awful. Although I was already able to enjoy and appreciate dry wines in those days, it occurred to

me that there were still some elements of “quality” I did not understand.

Today, with 30 years of experience behind me, I appreciate how hard it is to grow grapes that produce a wine with tannin like that. I also appreciate the fact that you should not try to drink such a wine until it is 10 or 15 years old. When we had it, the wine was just plain difficult to drink. Was it good quality? Was it worth several hundred dollars? Depends on whom you talk to.

Price and quality

With time and experience I have come to realize there are no esoteric and arcane flavor elements that makes one wine worth \$3,000 and another worth \$8. It is strictly a matter of supply and demand. Did a wine columnist in New York City praise it? Did it win awards in some competition in San Francisco? Does it have a pedigree of quality that stretches back a century or more? If you feel you can spend \$3,000

on a bottle of wine, it will likely turn out to be damn good.

As time goes along, you may come to recognize and enjoy the green pepper or hint of raspberry flavor in a wine, but an \$8 wine and a \$3,000 wine both end up as empty bottles after supper. For some people, \$3,000 is no big deal. As grape growers, most of us think about how many pounds of grapes we have to sell to pay for the bottle we all just tossed down, and it doesn't matter how pleasant the hint of violets or chocolate in the aftertaste may have been.

In my view, most wine enthusiasts in the U.S. start at the wrong end. They tend to join a “wine club” sponsored by a winemaker, liquor store owner, or distributor, who is going to slant the knowledge he gives toward the big ticket wines he can make a lot of money on. This means they are dependent on the advice and experience of someone who is motivated by the money he can make by prejudicing your taste toward his imports or his famous, high-dollar wines. One

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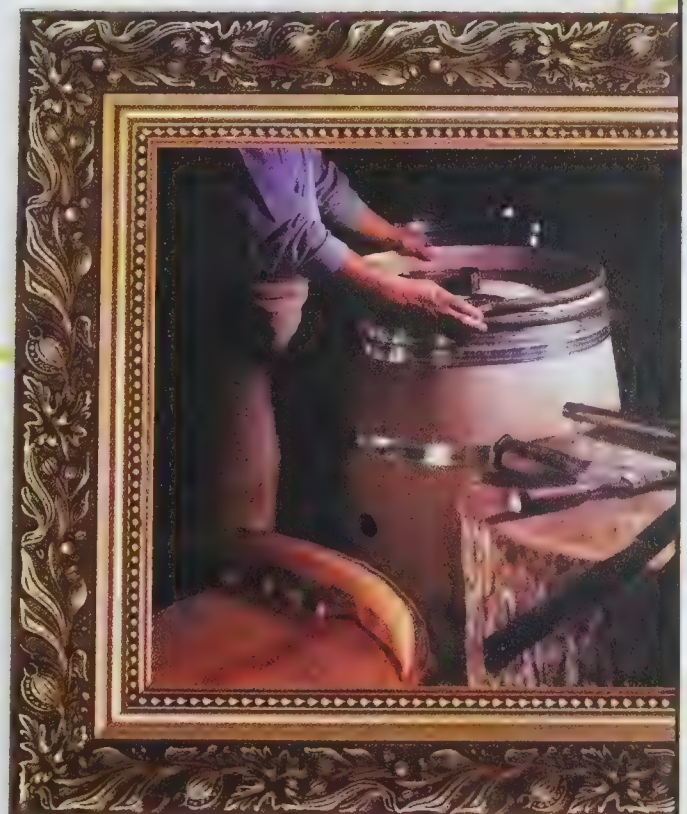
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wine, they are told, is good and another is bad. Since both of the wines taste like crap to most of us, we are fully confused relying on input from others to form an opinion.

In my experience, if you want to become a wine expert do not join a high-dollar club offering wines that may cost a \$100 or more and then try to learn how to appreciate why these wines are good. Go to the low end and buy some wines that are easy to enjoy.

California wineries are famous for high-value wines, but their real strength is in the oceans of sound, enjoyable, and very reasonably priced wines they produce. In most wine-producing areas of the world, the low-end wines taste like it. I am told that the *vin ordinaires* of France, for example, are often flat or harsh and acidic. In the U.S., we can hardly give them away because California has spoiled us to expect inexpensive wine to be sound and enjoyable.

Wine importers have perpetrated upon us all a great fallacy — of making some wines “great” that few of us can recognize. They have also made us believe that local wines are “bad” virtually by definition. Long ago, we all bought this concept hook, line, and sinker. Unbeknownst to us, the importers recognized that local wines were a threat to their position.

Labrusca-style wines

Labrusca-style wines, made from cultivars of *Vitis labrusca* (different from *Vitis vinifera*), are an excellent example of this. The early experts declared them “bad” and those of us looking for a mystical element in wine through the wisdom of these gurus were forced to accept that as fact.

In actuality, the terms Labrusca-style, Concord-style, and foxy all describe virtually the same types of wine, which not only became popular in America before Prohibition, but were exported to Europe before then and in fact won many awards there. These early Labrusca varieties were planted in Europe at the time of the phylloxera scare there and became very popular, until they were outlawed in France — as a threat to national security, I guess. They surely were a threat to the hallowed reputations of the centuries-old wine industry.

Nevertheless, old Labrusca hybrids like Noah and Clinton can still be found growing in certain places in France and still have a following there. In Romania, Isabella remains popular and Othello, another old Labrusca hybrid, is enormously popular in Hungary today. In the U.S., Labrusca-style wines are still in demand. Edelweiss, a Labrusca white grape that has become a leading white wine variety here, is one example. To identify these types of wine as inherently

“bad” is inaccurate. It took me many years to realize that they simply represent a different style of wine, which many people like.

One day we all will be free of this tyranny of “good” wines with subtle and mysterious flavors versus “bad” wines that lack them. We will not have to explain — or worse yet, apologize — that we like “Concord-style” or “Labrusca-style” wines. Good wines will taste good to us, and bad wines will be wines that are oxidized, thin and tasteless, or acidic, or that have unpalatable flavors or aromas. How poor we would be without California or European-style wines, and how much richer we will be when both have an equal place in our world of wine. ■

Author John Marshall began experimenting with grapes at his father's farm on the outskirts of St. Paul, MN in 1975. He began growing grapes commercially in Lake City, MN in 1988. He currently grows eight acres of wine grapes and has about two acres of nursery for winegrape cuttings, specializing in extremely cold-hardy winegrapes for extreme northerly, high-altitude, and short-season sites. Marshall has served on the MGGA Board for more than 25 years and is a Past President of that group. He is currently MGGA newsletter editor. Readers are invited to e-mail feedback to John Marshall at GRV@mchsi.com.

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Viable but non-culturable microbes — Stealthy wine spoilers?

Wine, like beer, is a beverage with a high level of microbiological stability. Among the large number of microorganisms found everywhere in nature, only a very small number of yeast and bacteria species can survive in wine. Wine's relatively high level of alcohol and low pH create an effective antimicrobial environment for the vast majority of microbes that come into contact with it. However, many of the limited number of microbes that can survive in wine have the ability to cause significant wine spoilage.

As with microbes in other beverage industries, wine spoilage microbes are detected primarily by culturing on suitable microbiological media (such as Wallerstein Nutrient agar, green yeast and mold, MRS agar, orange serum, etc.). Once a suitable media has been identified, antibiotics can be added to eliminate unwanted specimens and selectively culture specific microbes.

While culturing microbes on media is generally an effective method for detecting and counting wine microbes, it has two significant drawbacks. First, it can take anywhere from seven to 14 days for some wine spoilage microbes (*Brettanomyces* and lactic acid bacteria) to grow to detectable levels on media. That makes this a slow method to use to evaluate spoilage microbe potential in wine. This is especially problematic during stages of the winemaking process that require rapid microbe detection to prevent spoilage and thus maintain wine quality (for example, prior to the onset of alcoholic fermentation or during alcoholic fermentation, malolactic fermentation, and bottling, etc.).

Second, this method does not detect microbes that are in a viable but nonculturable (VBNC) state. Microbes in this physiological state are considered viable but dormant; they are unable to grow on standard culture media. Compared to other industries (public health, biotechnology, bioremediation, etc), recognition of this condition is relatively new to the wine industry. However, while the concept of VBNC is new, it is very likely that microbes in this state have always and will continue to play a significant role in spoiling wine.

In this column we will examine the concept of VBNC microbes and their potential impact on the winemaking process.

What is the VBNC state?

Until recently, it was generally assumed that microorganisms unable to grow on culture media existed in one state: dead. This notion was turned on its head in 1982 when a research paper from Rita Colwell's laboratory first described the phenomenon of VBNC.¹ This original paper on the topic demonstrated that two bacteria commonly found in nature (*Escherichia coli* and *Vibrio cholera*) were viable even though they could not be cultured on microbiological media. Since

this paper was published, several hundred research papers have described a similar phenomenon for many different microbes.

Microbes in a VBNC state are defined as cells that are metabolically active—but unable to grow on the standard microbiological media where they normally grow. In the VBNC state, the microbes are dormant with very low levels of metabolic activity, but they can be resuscitated to again become culturable.^{2,3} It is important to note that while cells in this state are defined as being nonculturable, it is possible that microbiologists have simply failed to provide the appropriate conditions to support growth on media (liquid or agar).

Cells entering the VBNC state undergo a number of physiological changes, including reduced size (dwarfing);⁴ changes in the structure of their cell wall;⁵ changes in the composition of cell membrane fatty acids;⁶ reductions in respiration rates, macromolecular synthesis (proteins), and nutrient transport;^{7,8} and formation of novel cold and starvation-shock proteins.^{9,10} An important distinction between VBNC and dead cells is that adenosine triphosphate (ATP) (energy carrier for cells) levels stay high in VBNC cells, but rapidly decline in dead cells.³

What induces the VBNC state in microbes?

It is clear that microbes in the VBNC state are physiologically different than microbes that are culturable or dead, but what induces microbes to enter the VBNC state? It has been demonstrated that microbes are forced into a VBNC state in response to different forms of stress, including oxygen concentration variation, temperature variation, starvation, osmotic concentration variation (high sugar content), exposure to white light, ethanol concentration, and/or addition of chemical agents to the wine environment (sulfur dioxide [SO₂], chlorine).^{2,3}

In the brewing industry, which has many similarities to the wine industry, the VBNC state has been induced in *Lactobacillus* spp. and *Brettanomyces* spp.^{11,12} These microbes were forced into the VBNC state by prolonged adaptation to beer, sub-lethal heat treatment, and anaerobic conditions.

Do wine yeast and bacteria enter VBNC state?

Since 2000, several published papers have suggested that VBNC microbes can exist in wine.^{13,14,15,16} In 2000, the first evidence for the presence of VBNC microbes in wine was published in a research paper from Aline Lonvaud-Funel's laboratory in France.¹³ In research there, wine microbes were shown to enter a VBNC state in response to different environmental stresses: *Acetobacter aceti* changed when deprived of oxygen, and lactic acid bacteria changed following addition of SO₂.

Since publication of Lonvaud-Funel's paper, subsequent studies have suggested that the following wine microbes also enter a VBNC state: *Acetobacter pasteurianus*, *Brettanomyces bruxellensis*, *Candida* sp., *Hanseniaspora uvarum*, *Rhodotorula mucilaginosa*, *Saccharomyces cerevisiae*, and *Zygosaccharomyces*

bailii. In non-enology related studies, another microbe found in wine, *Lactobacillus plantarum*, has been shown to enter the VBNC state.³

During the winemaking process, wine microbes encounter many of the same extreme environmental stressors already known to force other microbes into the VBNC state. Wine microbes experience:

- fluctuations between aerobic and anaerobic conditions,
- drastic environmental changes during fermentation,
- from high osmotic concentration (high sugar content) to low osmotic concentration,
- from high levels of nutrients to scarcity,
- from an absence of ethanol to high levels of ethanol,
- significant temperature swings, and
- processes intended to kill unwanted microbes, such as additions of SO₂ or Velcorin®.

How can VBNC wine yeast and bacteria be detected?

Over the past approximately 25 years, several methods have been employed to detect microbes in this condition: 1) use of propidium iodide to establish the presence of an intact cytoplasmic membrane;³ 2) use of flow cytometry to measure the *de novo* expression of a reporter-gene tagged with green fluorescent protein;¹⁷ 3) fluorescent staining using the direct epifluorescence technique (DEFT);¹³ and 4)

use of polymerase chain reaction (PCR)-based techniques, such as PCR denaturing gradient gel electrophoresis (PCR-DGGE),¹⁴ and the Scorpion™ assay from ETS Laboratories (St. Helena, CA).

Currently, wine industry researchers and commercial laboratory testing services are most often use either the DEFT, PCR-DGGE, or Scorpion™ methods to detect VBNC microbes. Current data suggests that all three methods can 1) detect viable microbes for long time periods after the microbes can no longer be detected using routine culture media; and/or 2) detect substantially higher levels of viable microbes than standard culture media can.

Briefly, these methods detect wine microbes as follows.

With the DEFT method, microorganisms are entrapped on a membrane filter, which is then stained with a fluorescent dye and examined by epifluorescence microscopy. The total microbial population can then be rapidly counted. Fluorescent antibodies are used to stain specific wine microbes.

In the PCR-DGGE (or reverse transcription PCR (RT-PCR)-DGGE) method, a specific region of microbe's genome (such as D1 region of 26S rRNA or ITS region of 5.8S rRNA) is PCR or RT-PCR amplified, and then PCR products are subjected to denaturing gradient gel electrophoresis to assess persistence of DNA or RNA products over time.



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The Scorpion™ method is a real-time, genetic detection assay that use Scorpion™ probes/primers in PCR reactions to rapidly identify and quantify spoilage microbes in wine. ETS Laboratories developed the Scorpion™ probes with DxS Genotyping (in the United Kingdom) and has exclusive global rights for all wine uses of the product. These genetic probes are targeted to specific wine spoilage microbes.

Debate exists within the wine industry about whether or not these methods are detecting dead microbes in addition to VBNC microbes. However, all three methods rebut these arguments and claim to detect VBNC microbes and not dead microbes. The DEFT VBNC microbe's method only counts microbes capable of metabolic activity, for example.^{13,16}

Use of the RT-PCR-DGGE method relies on the production of mRNA or rRNA as a target for PCR amplification.

Production of either mRNA or rRNA has been suggested as indicator of viability in non-wine microbes.¹⁴

ETS Laboratories indicates that Scorpion™ assays only detect viable cells because "wine pH is inhospitable to unprotected DNA, therefore the genetic material from dead cells is readily destroyed in the wine environment. Our method detects DNA that is protected inside viable cells."¹⁸

Are VBNC wine yeast and bacteria a threat to wine quality?

There is now overwhelming evidence that VBNC microbes exist in wine, but do they have the capacity to spoil wine? For wineries this is the most important question regarding VBNC microbes, but the answer is not known.

We do know, as mentioned above, that the brewing industry now has strong evidence that VBNC lactic acid bacteria (specifically *Lactobacillus brevis* and *Lactobacillus lindneri*) can cause beer spoilage. When these microbes enter the VBNC state, they get dramatically smaller.¹⁹ The smaller size microbe is a serious threat to unpasteurized beers that must be filtered, because the smaller microbes can pass through membrane filters.

The survival of microbes in the VBNC state is only meaningful if they can revert back to a fully metabolically active and fully culturable state, thus allowing them to again become agents of virulence or spoilage. Studies so far show that resuscitation from a VBNC state is only possible when stress on microbes is alleviated (such as reintroduction of oxygen or reduced SO₂ concentration).

Several studies have demonstrated the resuscitation ability of wine microbes from VBNC to fully culturable.^{13,15,16} This includes *Acetobacter aceti*, *Acetobacter pasteurianus*, *Brettanomyces bruxellensis*, *Zygosaccharomyces bailii*, and *Rhodotorula mucilaginosa*.



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According to unpublished data from Charlie Edwards' laboratory at Washington State University, (Pullman, WA), there is indirect evidence for the resuscitation phenomenon of VBNC *Brettanomyces*: when SO₂ is added to *Brettanomyces* grown in wine, plate counts disappear or are dramatically lower, but cells are still shown to be viable as detected by epifluorescence microscopy. After a period of time (several days or weeks), the cells return to a culturable state. Nicole "Coco" Umiker, the graduate student working on this project, notes that strains of *Brettanomyces* respond quite differently to SO₂ with some more resistant than others.

While wine microbes were shown to resuscitate, studies are still required to directly show that resuscitated microbes can cause wine spoilage.

It is tantalizing to speculate, however, whether resuscitated VBNC microbes are responsible for spoiling wines thought to be free of spoilage microbes even according to diligent checks via culture media. A good example of this scenario playing out is during and after the bottling process. In this case, a wine is membrane-filtered during bottling and develops secondary fermentation in bottle even though the wine was cultured on media plates and shown to have undetectable levels of microbes.

A likely explanation is that the maller VBNC microbes pass through the membrane filter, go into the bottles, and when growth conditions become favorable again (such as decrease in free-SO₂ concentration or elevated oxygen levels), the resuscitated microbes initiate spoilage activities. In support of this possibility, Millet and Lonvaud-Funel showed that both VBNC wine yeast and bacteria could pass through a 0.45 µm membrane filter, which is normally a small enough pore size to retain all wine microbes.¹³

Conclusion

Based on mounting evidence showing that wine microbes can exist in a VBNC state, what is known about the microbial populations existing during the winemaking process is now considerably more complex. If direct evidence that resuscitated VBNC wine microbes cause wine spoilage can be shown, then this complex microbial ecology becomes quite significant to all wineries. It will require wineries to implement a culture-independent method for microbe detection and enumeration (DEFT, RT-PCR-DGGE, Scorpion™ assays) in conjunction with culture-plating as part of a comprehensive microbiological quality control program. ■

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Recessions do not last forever, but smart companies do

TOOLS FOR MOTIVATING EMPLOYEES IN CHALLENGING TIMES

Close the newspapers and turn off the television. We all know that times are challenging right now, so let's say "Enough already!" As leaders of our companies, let's help our employees get through the tough times and help them learn and grow. Let's do what we can to inspire employees to greatness and have them leave at the end of the work day feeling fulfilled and proud and able to tackle anything that comes their way.

Robert Schuller wrote in his best selling book — "Tough Times Don't Last But Tough People Do!" — that, as leaders, we have the ability to influence others to view the cup as half full and to help guide them to make that cup overflow. How effectively we deal with tough times determines when we will be able to rise to the top of the mountain again.

The companies that invest time and energy into their employees during down times are the companies that bounce back much faster and are able to chart a positive direction to reach their goals. Below are some ideas to motivate employees when times are tough:

GIVE EMPLOYEES A VOICE — One of the best ways to get the true pulse of your organization is to do an employee survey. A properly administered survey will empower employees to speak out and be heard. It imparts a sense that management cares what employees are thinking and feeling.

However, for the survey to be a successful motivational tool, the results need to be properly addressed and communicated to the organization. Often, the most effective "fixes" suggested by survey results are no cost, and many will have a dramatic impact on the organization.

Before you administer the survey, plan how you will address any issues that may come up and how and when you will communicate the survey results and any actions or changes the survey inspires. This is crucial. With a plan in place and a clear implementation strategy, the employee survey can yield powerful results that will increase employees' feelings of security and hope.

TWO-WAY COMMUNICATION — The number one issue in organizations is communication. Add a little stress from our current economy and WHAM — you have communications shutdown! Now is the time to help employees open up and come out of their shell.

Inviting them to a communication workshop can provide employees with new skills to communicate effectively with their colleagues, managers, and with you. When leaders are involved and the communication comes from the top, the workshop becomes even more potent.

Whether dealing with different personality styles, learning how to ask for what you need, or dealing with conflict situations, we can all benefit from learning new communications skills. Providing common ground and language can have a huge impact on increasing communication and productivity in an organization.

CREATIVE INCENTIVES — Incentives do not have to cost a lot of money to be effective. Right now employees want to decrease the stress and get the focus off of the negative. Organizing fun get togethers is a great way to do this — schedule a game challenge during lunch or a Friday afternoon celebration.

By getting people together you build the team and spirit of the organization. Recognition for a job well done is another inspiring tool, and it is free!

PAYING EMPLOYEES APPROPRIATELY — Is your current compensation structure motivating your winery employees in challenging times? Analyzing your current compensation structure may dramatically affect your bottom-line.

Are you paying your employees appropriately? Paying under market discourages employees and destroys their motivation, while paying over market can jeopardize the financial stability of the company. In 2008, many companies are putting their compensation structure under a microscope to make sure that this foundation is solid and on target.

COACH, COACH, COACH — The role of the leader and the skills of your managers are more important now than ever. If your managers do not know how to coach and effectively manage performance, now is the time to teach them these skills.

Managers and supervisors need to help employees see their roles and contributions in order to achieve the best performance possible. They need to be able to communicate the organization's goals and the employee's role in achieving them, to clarify performance expectations and keep standards high.

As a coach, the manager needs to help people understand why those standards are important. It is also important to let people know how they can add value and why it is so important now. Tell employees you need their support, cooperation, and hard work. The winery can not afford resistance or denial. Then, hold them accountable. Discourage complaining and looking backward. Once you have communicated openly and thoroughly, ask people to join you in moving ahead.

DIFFERENTIATE YOURSELF — In this economy, with spending down and fears high, we need to do everything that we can to keep our current customers and attract new customers. Why do you retain some customers and lose others?

Do you have a plan to differentiate yourself from competitors in order to cultivate loyal customers at your winery, specifically in your tasting room and through your wine club? By clearly defining your "customer service brand" and how you want customers to think and feel about your winery, you are able to send a clear message to

PERSONNEL POINT OF VIEW

customers about why they should choose your wine. You are giving them an "experience" that will entice them to buy when visiting the tasting room and sign up for the wine club.

Once you have clarified who you are, then developing standards for customer service and communicating them throughout the organization is the next key step. By clearly understanding the customer service brand and standards expected, employees will feel motivated to do their best and will nurture loyal customers.

What we do in down times determines how successful our organizations will be when the economy starts to level out

again. By investing in your managers and employees, listening to what they have to say, communicating and coaching them, and giving them tools and incentives to do their best, you will be laying the groundwork for a company that not only makes it through these tough times, but thrives. ■

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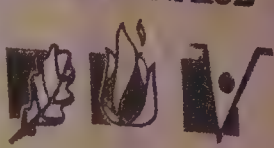
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Expression

Questionable wine excise tax

Continued from page 57

Undermines Rural Development

— Increasing excise taxes will seriously undermine the ability of new and growing wineries to establish and strengthen their business and to build a strong agricultural base. The number of wineries across the country has been growing dramatically, more than doubling in the last decade. These wineries are important contributors to the rural economy. Economically damaging wineries through poor tax policy would seriously undermine the small family farming and rural economic development renaissance, driven in large part, by the exponential growth of small wineries across the U.S.

Hinders Growth — Excise tax increases on wine have detrimental economic effect on wineries. Small wineries have limited access to credit — particularly in the current economic climate. The cash necessary to pay increased excise taxes will come directly out of the available capital for expansion and therefore will severely limit industry growth. Wineries that have no access to loans to help pay for an excise tax increase may cease to exist.

Conclusion

For these reasons, an increase in wine excise tax is both poor tax policy and economically harmful to small businesses and rural areas. Such a tax change would not achieve a definable positive policy purpose and would ultimately lead wineries to make an impossible choice — maintain market share with a loss of profitability, or higher prices and loss of unit volume. Given the inherent economic and cultural benefits of wine, wineries should not be forced into making such a choice. ■

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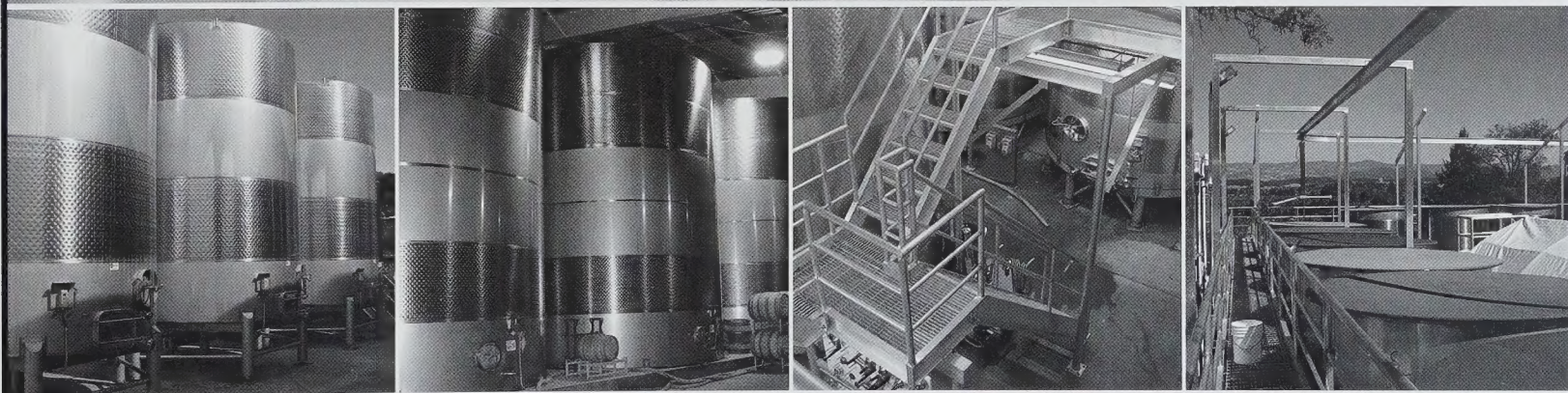
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Amador Cnty Winegrape Growers	35	209-245-6772	Same	amadorwinegrapes.com	Owens Illinois	5	707-646-7417		kyoder@o-i.com
American Ag Credit	31	707-545-1200	707-545-9400	tlindley@agloan.com	P&L Specialties	49	888-313-7947	707-573-3140	pnlspecialties.com
APPCO	76	707-433-9471		appco.net	Personnel Perspective	42	707-576-7653	707-576-8190	personnelperspective.com
ASEV	41	530-753-3142		asev.org	Plantra	80	800-518-6872	805-462-1378	steve@plantra.com
Begerow USA	55	585-398-2783	585-398-0067	bob.spadafora@begerow.com	PRO Refrigeration	40	800-845-7781	253-735-2631	prochiller.com
Beverage Supply Group	36	800-585-5562		bsgwine.com	Ramondin USA	3	707-499-2277	707-257-1408	ramondinusa@ramondinusa.com
The Boswell Company	33, 82	415-457-3955	415-457-0304	boswellcompany.com	Ray Carlson & Associates	49	707-528-7649	707-571-5541	rcmaps.com
California Grapevine Nursery	13	800-344-5688	707-963-1840	californiagrapevine.com	ReCoop	12	707-829-7103	707-824-0365	recoop.net
California Seed & Plant Lab	28	916-655-1581	916-655-1582	randhawa@calspl.com	St. Patrick's of Texas	53	512-989-9727	512-989-8982	stspats@bga.com
Castoro Bottling Company	45	805-467-2002	805-467-2004	niels@castorobottling.com	Scion Advisors	32	707-258-9130		scionadvisors.com
Cedar Ridge Vineyards	18	519-676-5512	519-676-5160		Scott Laboratories	50	707-765-6666	707-765-6674	scottlabs.com
Central Valley Builders Supply	24	707-967-4300	707-963-8952	cvbsupply.com	Silver State Stainless	47	775-246-1180	775-246-1183	silverstatestainless.com
Criveller Company	28	905-357-2930	905-374-2930	criveller.com	Spec Trellising	50	800-237-4594	215-357-3122	spectrellising.com
D&S Ag Designs	48	866-594-9943	559-651-2161	dandsagdesigns.com	Sunridge Nurseries	15	661-363-VINE	661-366-4251	sunridgenurseries.com
Duarte Nursery	77	209-531-0351	209-531-0352	duartenursery.com	SureHarvest	47	831-477-7797	831-477-7790	sureharvest.com
EP Aeration	46	800-556-9251	805-541-6149	epaeration.com	Tonnellerie Bel Air	18	707-965-2119	707-965-2923	ac@arminee.com
Euro-Machines, Inc.	32	707-864-5800	707-864-5879	karenateuro@aol.com	Tonnellerie Boutes	16	510-799-1518	510-799-1557	boutesusa@sbcglobal.net
Government Liaison Services	45	800-642-6564	703-525-8451	gls@trademarkinfo.com	Tonnellerie Garonnaise	80	707-363-7555		garonnaise.com
Grover Soil Solutions	74	866-764-5765	209-545-3315	wondergrow.iz	Tonnellerie Quintessence	73	707-935-3452	707-935-3422	tonnelleriequintessence.com
Hansel Leasing	47	707-544-2822	707-578-8306	jtaylor@hanselleasing.com	Tonnellerie Saury	54	707-944-1330	707-944-1370	info@sauryusa.com
Hill & Associates	80	707-258-2000		bestwinejobs.com	Tonnellerie Sirugue	40	310-452-8147	310-452-7847	sirugueusa@earthlink.net
Hinman & Carmichael	81	415-362-1215	415-362-1494	beveragelaw.com	T.W. Boswell	30	707-255-5900	707-255-5952	twboswell.com
Hoyt Shepston	42	800-675-HOYT	650-634-8063	fred@hoyt-shepston.com	Turrentine Brokerage	25	415-209-9463	415-209-0079	turrentinebrokerage.com
Indy International					Unitech Scientific	33	562-924-5150		unitechscientific.com
Wine Competition	41	765-494-3614		indyinternational.org	Vineyard Industry Products	40	800-544-2210	707-431-0807	vineyardindustryproducts.com
Jim's Supply Co.	2	800-423-8016	661-324-6586	jimssci@jimssupply.com	Vintage Nurseries	20	800-499-9019	805-758-4999	vintagenurseries.com
JMS Stylet Oil	22	772-562-8770	772-562-7202	stylet-oil.com	VTI -Valtronics	33	209-754-0707	209-754-0104	val-tronics.com
Kendall Jackson Nursery	26	707-836-2021	707-836-2266	kj.com	Weedbadger	44	800-437-3392	701-778-7501	weedbadger.com
GW Kent	21	800-333-4288	734-572-1300	gwkent.com	Westec Tank/ Belli Corp.	83	707-431-9342	707-431-8809	joe@westectank.com
Kimco Mfg.	74	800-356-9641	559-277-9358	kimcomfg.com	Western Square Industries	23	800-367-8383	209-944-0934	westernsquare.com
Kinsey Ag Services	37	573-683-3880	573-683-6227	kinseyag.com	Winegrowing Consortium	19	888-897-3030		winegrowingconsortium.com
KLR Machines	25	707-823-2883	707-823-6954	klrmachines.com	Wolff's Welding & Fabrication	36	707-933-8590		dw@wolffswelding.com
Korvan by Oxbo	39	888-6-Korvan		oxbocorp.com	World Cooperage	84	707-255-5900	707-255-5952	worldcooperage.com
Stephen Koster Consulting	36	707-433-7029		stevekoster@hughes.net	Yanmar Agricultural Machinery	9	770-877-6224		yanmar.com
Lake County Grapevine Nursery	18	707-968-9674		lcn.net	Xtraoak	11	707-836-9742	707-836-9759	xtraoak.com
Lake Cnty Winegrape Comm.	38	707-993-3121		lakecountywinegrape.org					
Lallemmand	8	707-526-9809	707-303-6333	lallemmandwine.us					
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